DASNY
DORMITORY AUTHORITY STATE OF NEW YORK

PROJECT MANUAL

DEYO HALL REHABILITATION AND UPPER FLOOR ADDITION

STATE UNIVERSITY OF NEW YORK AT NEW PALTZ

JDE NUMBER: 3418309999

DATE: 08/29/2018

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Section 1.01 - Definitions

The following terms as used in the Contract Documents shall be defined as follows:

Addendum or Addenda – Additional provisions of the Contract Documents issued in writing prior to the receipt of bids.

Application for Payment – A Contractor's written billing request, on a form:

A. prepared by the Owner from the Schedule of Values approved by the Owner;

B. completed by the Contractor;

C. adjusted by the Owner; and

D. signed by the Contractor,

requesting partial or full payment for partial or full performance of the Contract.

Beneficial Occupancy – The stage in the performance of the Work prior to Substantial Completion when a designated portion of the Work is sufficiently complete in accordance with the Contract Documents so the Owner or Client can occupy or utilize such portion of the Work for its intended use, evidenced by the Notice of Beneficial Occupancy executed by the Owner.

Change Order – Written notice, in a standard Owner's form, to the Contractor, signed by the Contractor and executed by the Owner, changing the Contract Documents in accordance with General Conditions Article 7 - Changes in the Work, or a Forced Change Order.

Claim - A demand by the Contractor seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, an extension of time, or other relief with respect to the terms of the Contract. The term Claim also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract.

Client - The entity for whom the Dormitory Authority is performing services, including subsidiaries, agents, related corporations, or fiduciaries of the entity.

Completion and Acceptance - The stage in the performance of the Work when all Work required to be performed by the Contract, except any Work that may be required in the future by:

A. any warranty or guarantee in the Contract Documents;

B. General Conditions Article 6 – Subcontracts, Sections 6.01 E through I;

C. General Conditions Article 14 - Protection of Persons and Property; or

D. General Conditions Article 15 – Insurance and Bonds,

is complete in accordance with the Contract Documents, evidenced by the Notice of Completion and Acceptance executed by the Owner.

Contract Amendment – A written instrument, signed by an authorized officer of the Dormitory Authority and an authorized officer of Contractor, amending, modifying, changing, or supplementing the Contract.

Construction Manager - A natural person, partnership, limited liability company, corporation, or other legal entity regularly engaged in management of construction projects, and so designated by the Owner.

Consultant - A natural person, partnership, limited liability company, corporation, or other legal entity providing architectural, engineering, construction management, testing, inspection, commissioning, or other professional services, and so designated by the Owner.

Contract - The agreement between the Owner and the Contractor consisting of the Contract Documents.

Contract Documents - The Notice to Bidders, Information for Bidders, Form of Bid, Agreement, Payment Bond, Performance Bond, General Conditions, General Requirements, Drawings, Specifications, Addenda, Change Orders, Contract Amendments, and all provisions of law deemed to be included in the Contract.

Contractor - A natural person, partnership, limited liability company, corporation, or other legal entity with whom the Owner enters in to the Contract to perform the Work.

Design Professional - A natural person, partnership, limited liability company, corporation, or other legal entity providing architectural or engineering professional services, and so designated by the Owner.

Disputed Work Directive - Written directive, in a standard Owner's form, from and executed by the Owner to the Contractor directing the Contractor to proceed with the Work described in the Disputed Work Directive in accordance with General Conditions Article 10 – Claims and Disputes.

Dormitory Authority - Dormitory Authority of the State of New York, a public benefit corporation established by the laws of the State of New York with its principal office located at 515 Broadway, Albany, New York, 12207-2964.

Extra Work - Any work in addition to the Work initially required to be performed by the Contractor pursuant to the Contract Documents.

Facility – the operating unit of the Client where the Site is located.

False Claim – Any Claim which is, either in whole or part, false or fraudulent.

False Representation – This action takes place when a person has knowledge of the value of the work and materials supplied, performed, or proposed (the "Information") constituting the Claim, Change Order, or Application for Payment and either:

A. acts in deliberate ignorance of the truth or falsity of the Information or

B. acts in reckless disregard of the truth or falsity of the Information.

Forced Change Order –Written notice, in a standard Owner's form, to the Contractor, without the Contractor's signature and executed by the Owner, changing the Contract Documents in accordance with General Conditions Article 7 – Changes in the Work.

Furnish - To deliver to the Site ready for installation.

Hazardous Material **–** any substance (gas, liquid, or solid) or agent (biological, chemical, radiological, physical, or having two or more of the preceding characteristics) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors, including but not limited to heavy metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, herbicides, dioxins, biological wastes, carcinogens, asbestos or any substance containing asbestos, polychlorinated biphenyls, lead, urea formaldehyde, explosives, radionuclides, radioactive materials, chemicals known or suspected to cause cancer or reproductive toxicity, pollutants, effluents, contaminants, emissions, infectious wastes, any petroleum or petroleum-derived waste or product or related materials, and any item defined as a hazardous, special, or toxic material, substance, or waste under any Hazardous Material Law, including, but not limited to, the NYS Environmental Conservation Law and Title 6 of the New York Code of Rules and Regulations.

Hazardous Material Laws **–** collectively, any present federal, state or local law, including all valid amendments, relating to public health, safety, or the environment, including without limitation, the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §6901 et seq.; the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 ("SARA"); the Clean Air Act, 42 U.S.C. §7401 et seq.; the Hazardous Materials Transportation Act, 49 U.S.C. §5101 et seq.; the Clean Water Act, 33 U.S.C. §1215 et seq.; the Toxic Substances Control Act, 15 U.S.C. §2601 et seq.; the Safe Drinking Water Act, 42 U.S.C. §300f et seq.; the Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. §136 et seq.; the Emergency Planning and Community Right-to-Know Act, 42 U.S.C. §11001 et seq.; the Occupational Safety and Health Act of 1970, 29 U.S.C. §651 et seq.; the Atomic Energy Act, 42 U.S.C. §2201 et seq.; the NYS Environmental Conservation Law; the NYS Labor Law; the NYS Public Health Law; and the amendments, regulations, orders, decrees, permits, licenses or deed restrictions now or hereafter enacted or promulgated under any such statute.

Install - To unload at the delivery point at the Site and perform every operation necessary to establish secure mounting and correct operation at the proper location.

Letter of Intent - Written notice, signed by the Owner, to the Contractor, which accepts the Contractor's Form of Bid and transmits the Agreement, Payment Bond, Performance Bond, and other documents to the Contractor for execution.

Means and Methods of Construction - Labor, materials, temporary structures, tools, plant, and construction equipment, and the manner and time of their use, necessary to accomplish the result intended by the Contract Documents.

Notice of Beneficial Occupancy – Written notice, in a standard Owner's form, to the Contractor, executed by the Owner and delivered to the Contractor prior to Substantial Completion, that certain Work of the Contract Documents, identified in such Notice of Beneficial Occupancy, satisfies the criteria for Beneficial Occupancy and will be occupied or utilized by the Owner or Client.

Notice of Completion and Acceptance **–** Written notice, in a standard Owner's form, to the Contractor, executed by the Owner, that the Work required to be performed by the General Requirements, Drawings, Specifications, Addenda, and Change Orders, except any Work required by any warranty or guarantee in the Contract Documents, satisfies the criteria for Completion and Acceptance.

Notice of Physical Completion- Written notice, in a standard Owner's form, to the Contractor, executed by the Owner, that the Work of the Contract Documents satisfies the criteria for Physical Completion.

Notice of Substantial Completion - Written notice, in a standard Owner's form, to the Contractor, executed by the Owner, that the Work of the Contract Documents satisfies the criteria for Substantial Completion and constitutes the start of the guarantee period.

Notice to Proceed –

A. Written notice, signed by the Owner, to the Contractor, that acknowledges receipt by the Owner of the signed Agreement, Payment Bond, and Performance Bond from the Contractor and directs the Contractor to start performance of the Work; or

B. Written notice, in a standard Owner's form, to the Contractor, executed by the Owner, directing the Contractor to proceed with the change in the Work described therein in accordance with General Conditions Article 7 – Changes in the Work. A Notice to Proceed cannot change the Contract amount or the date to achieve Substantial Completion. A Notice to Proceed can change only the General Requirements, the Drawings, or the Specifications.

NYS – New York State

Other Contractor(s) – The one or more natural persons, partnerships, limited liability companies, corporations, or other legal entities who have entered in to a contract with the Owner to perform work (including services) at or near the Site, identified in the Contract Documents or in writing by the Owner, including, but not limited to, contractors, Construction Managers, Consultants, and Design Professionals. Other Contractors does not include the Contractor.

Owner - Dormitory Authority of the State of New York.

Owner's Representative - A natural person, partnership, limited liability company, corporation, or other legal entity so designated by the Owner to act on behalf of the Owner. See General Conditions Section 2.03 for limitations and further provisions on the Owner's Representative.

Physical Completion – The stage in the performance of the Work when all Work to be performed at the Site, except any Work that may be required in the future by any warranty or guarantee in the Contract Documents, is complete in accordance with the Contract Documents, evidenced by the Notice of Physical Completion executed by the Owner.

Project - The work at or near the Site(s) carried out pursuant to the Contract and one or more other contracts.

Project Management Program – The software program used by the Owner to manage, monitor, and oversee performance of the Contract.

Provide - To Furnish and Install the Work complete in place and ready for its intended use.

Schedule of Values – a form provided by the Owner, completed by the Contractor, and submitted to the Owner for review and written approval; the completed, approved form establishes a minimum level of allocation of the Contract amount among the items of Work to formulate the Contractor's billing requests.

Site - The area(s) within the Contract limit, as indicated by the Contract Documents.

Stop Work Order - Written notice, signed by the Owner, to the Contractor, to cease or hold Work of the Contract Documents.

Subcontract - An agreement between the Contractor and Subcontractor for Work on the Site.

Subcontractor - A natural person, partnership, limited liability company, corporation, or other legal entity under contract with the Contractor, or under contract with any Subcontractor, to perform any portion of the Work, or to provide any labor, material, equipment, or service at the Site.

Substantial Completion – The stage in the performance of the Work when all Work is sufficiently complete in accordance with the Contract Documents so the Owner or Client can occupy or utilize the Work for its intended use, evidenced only by the Notice of Substantial Completion executed by the Owner. Issuance of a temporary certificate of occupancy or a temporary approval for occupancy does not establish Substantial Completion.

Work - All obligations explicitly and implicitly imposed upon the Contractor by the Contract Documents.

ARTICLE 2 -- CONTRACT DOCUMENTS

Section 2.01 - Captions

The table of contents, titles, captions, headings, running headlines, and marginal notes contained herein and in the Contract Documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect the interpretation of the provisions to which they refer.

Section 2.02 – Electronic Data Transfer

A. Electronic data includes, but is not limited to, all digital versions of any Contract Document, all digital files produced by mechanical, facsimile, electronic, magnetic, digital or other programs, programming notes or instructions, activity listings of electronic mail receipts or transmittals, output resulting from the use of any software program, including but not limited to, word processing documents, spreadsheets, database files, charts, graphs, drawings, specifications, outlines, electronic mail, personal digital assistant messages, instant messenger messages, PDF files, PRF files, batch files, ASCII files, DWG files and any other type of files now or hereafter allowed by Owner.

B. The Owner reserves the right to implement an electronic payment program for payments due the Contractor. Prior to implementation, the Owner, in writing, shall notify the Contractor one hundred twenty (120) calendar days prior to the effective date of the electronic payment program. Commencing on or after the electronic payment effective date, all payments, due the Contractor, shall only be rendered electronically, unless payment by paper check is authorized in writing by the Owner. Commencing on or after the electronic payment effective date, the Contractor, further acknowledges and agrees that the Owner may withhold payments, if the Contractor has not complied with the Owner's policies and procedures relating to the electronic payment program in effect at such time, unless payment by paper check is authorized in writing by the Owner.

C. Electronic data produced in connection with the Contract is proprietary information of the Owner and to be treated as confidential and not to be disclosed to, or shared with others outside the limits of the Contract without the express written consent of the Owner. The Owner makes no warranty, express or implied, as to the accuracy of the information transferred.

D. The Contractor shall pay, on behalf of the Owner, any loss which the Owner becomes legally liable to pay as a result of a claim by any person or entity against the Contractor or Owner, which results directly from an act, error, or omission of the Contractor in the provision of electronic data in respect to the Contract.

Section 2.03 - Owner

A. The Contract constitutes the entire agreement and understanding between the Contractor and the Owner with respect to the Project and supersedes all prior agreements, arrangements and understandings, and all trade custom and trade usage, and the construction of any provision of the Contract shall not be affected by the wording of any other agreement, whether between the Contractor and the Owner or involving other parties. The Contract may not be amended, modified, supplemented, or changed in any way except in accordance with General Conditions Article 7 – Changes in the Work or a Contract Amendment. The legal relationship between the Owner and the Contractor shall be governed solely by the Contract and no rights shall arise on any other basis, including but not limited to, oral agreement, partial performance, estoppel, conduct of the parties, course of conduct or any other course of dealing involving the Project or any other project. The meaning and intent of the Contract Documents shall be interpreted solely by the Owner.

B. The Owner shall give all orders and directions contemplated under the Contract relative to the execution of the Work. The Owner shall determine the amount, quality, and acceptability of the Work and shall decide all questions which may arise in relation to said Work. The Owner's estimates and decisions shall be final except as otherwise expressly provided herein.

C. The Owner may, at its sole and exclusive discretion, waive certain provisions of the Contract Documents. Such waiver shall only be done by written instrument signed by a duly authorized officer of the Owner, and any such waiver shall apply solely in accordance with its terms and shall not act as a waiver of any provision of the Contract Documents, or estoppel against the enforcement thereof, in connection with any subsequent or separate event involving the Project or other projects.

D. Any differences or conflicts concerning performance which may arise between the Contractor and Other Contractors performing work for the Owner shall be analyzed and resolved by the Owner as warranted by the circumstances. The Owner’s exercise of discretion in this regard shall be sole and exclusive and its decision concerning such differences and conflicts shall be final and binding.

E. The Owner may act through an Owner’s Representative designated as such in writing by the Owner. Unless otherwise designated by the Owner, the Owner’s Representative is the Owner’s employee assigned to the Project as the project manager. Unless otherwise stated in writing by the Owner, the Owner’s Representative is not an authorized officer of the Owner, does not have authority to approve a Labor Rate Worksheet on behalf of the Owner, does not have authority to waive the requirement for a narrative and fragnet schedule of General Conditions Section 7.01 C. 4, does not have authority to waive any provision of the Contract Documents and does not act for the Owner for General Conditions Article 15 – Insurance and Bonds. Unless otherwise stated in writing by the Owner and notwithstanding the other provisions of this paragraph, the Owner’s Representative does have authority to issue a direction to attend a meeting in accordance with General Conditions Section 4.04, a Notice to Proceed in accordance with General Conditions Section 7.01 and a Disputed Work Directive in accordance with General Conditions Section 10.01. The Owner may change the Owner’s Representative and the scope of her, his or its duties by written notice to the Contractor in accordance with General Conditions Section 2.04. The Owner’s Representative’s signature by itself on a Change Order is not execution of a Change Order by the Owner. See General Conditions Section 7.01 A. 5 for the requirements for execution of a Change Order by Owner.

Section 2.04 - Notice and Service Thereof

A. Any notice to the Contractor from the Owner relative to any part of the Contract shall be in writing and service considered complete when said notice is sent or delivered in person to the Contractor or its authorized representative, at the street address, postal address or email address given by the Contractor in the Form of Bid. The Contractor may change any of these addresses by written notice to the Owner's Procurement Unit, 515 Broadway, Albany, New York 12207 - 2964; such change shall not be effective until Contractor receives from the Owner's Procurement Unit a written acknowledgement that the change has been received.

B. Any notice from the Contractor to the Owner required by any part of the Contract shall be in writing and shall be sent or delivered to the Owner's Representative at the street address, postal address or email address for the Owner's Representative given in the Notice to Bidders. The Owner may change the Owner's Representative or any of these addresses by written notice to the Contractor. If any part of the Contract shall require the Contractor to provide notice to any other employee or unit of the Owner, the notice to such employee or unit is in addition to, and does not replace, the notice to the Owner's Representative. Notice to the Owner may be delivered by certified mail, overnight delivery by a nationally recognized courier or, if an email address is provided, email. The Owner's Representative will endeavor to provide a written acknowledgment of receipt of the notice but any failure to provide such written acknowledgment shall not be a breach of the Contract, shall not in any way alter the Contractor's obligation to provide timely notice and shall not in any way alter any of the other obligations of the Contractor under the Contract.

C. For all notices from the Contractor to the Owner required by any part of the Contract, the Contractor shall have the burden of proving the Owner's receipt of the notice.

Section 2.05 - Nomenclature

Materials, equipment, or other Work not defined or specified in the Contract but described in words that have a generally accepted technical or trade meaning shall be interpreted as having said meaning in connection with the Contract.

Section 2.06 - Invalid Provisions

If any term or provision of the Contract Documents or the application thereof to any natural person, partnership, limited liability company, corporation or other legal entity or circumstance shall, to any extent, be determined to be invalid or unenforceable, the remainder of the Contract Documents, or the application of such terms or provisions to natural persons, partnerships, limited liability companies, corporations or other legal entities or circumstances other than those to which it is held invalid or unenforceable, shall not be affected thereby and each term or provision of the Contract Documents shall be valid and be enforced to the fullest extent permitted by law. It is the intent of the Owner and the Contractor that all provisions of the Contract shall be construed to be valid under applicable law and shall be enforced to the maximum extent possible.

Section 2.07 – Interpretation of Contract Documents

A. Should any provision in the Contract Documents be in conflict or inconsistent with the General Conditions or supplements thereto, the General Conditions or supplements thereto shall govern.

B. Figured dimensions shall take precedence over scaled dimensions. Larger scale Drawings shall take precedence over smaller scale Drawings. Latest Addenda shall take precedence over previous Addenda and earlier dated Drawings and Specifications.

C. Should a conflict occur in or between or among any parts of the Contract Documents that are entitled to equal preference, the better quality or greater quantity of material or more onerous provision in the Owner's judgment shall govern, regardless of cost, unless the Owner directs otherwise in writing. In each conflict, the Owner, in its sole and exclusive discretion, shall determine whether the quality, quantity or onerous provision method will be used to resolve the conflict.

D. Drawings and Specifications are complementary. Anything shown on the Drawings and not mentioned in the Specifications, or mentioned in the Specifications and not shown on the Drawings, shall have the same effect as if shown or mentioned in both.

E. The term "materials" includes "supplies".

F. Words of the masculine gender shall be deemed and construed to include correlative words of the feminine and neuter genders. Unless the context shall otherwise indicate, words importing the singular number shall include the plural number and vice versa.

Section 2.08 - Copies of Contract Documents

The Owner may furnish to the Contractor up to three (3) paper copies and one electronic (PDF) copy of the Contract Documents without charge. Additional sets may be furnished at the costs of reproduction and mailing.

ARTICLE 3 -- SITE CONDITIONS

Section 3.01 - Subsurface or Site Conditions Found Different

A. The Contractor acknowledges that the Contract amount set forth in its bid includes such provisions which the Contractor deems sufficient for all subsurface or site conditions the Contractor could reasonably anticipate encountering as indicated in the Contract Documents, or borings, reports, rock cores, foundation investigation reports, topographical maps, or other information available to the Contractor or from the Contractor's inspection and examination of the Site prior to submission of bids.

B. The Owner assumes no responsibility for the correctness of any boring or other subsurface information and makes no representation whatsoever regarding subsurface conditions and test borings, reports, rock cores, foundation investigation and topographical maps which may be made available to the Contractor.

C. Should the Contractor encounter subsurface or site conditions at the Site materially differing from those shown on or described in or indicated in the Contract Documents, the Contractor shall immediately give written notice to the Owner of such conditions and shall not disturb said conditions until authorized to do so by the Owner in writing.

D. Subsurface or site conditions found materially differing from those that could have been reasonably anticipated may be cause for change to the Contract amount and time of completion. This determination will be made at the sole and exclusive discretion of the Owner.

Section 3.02 - Verifying Dimensions and Conditions

A. The Contractor shall take all measurements at the Site and shall verify all dimensions and conditions at the Site before proceeding with the Work. If said dimensions or conditions are found to conflict with the Contract Documents, the Contractor immediately shall refer said conflict to the Owner in writing. The Contractor shall comply with any revised Contract Documents.

B. During the performance of the Work, the Contractor shall verify all field measurements prior to fabrication of building components or equipment, and proceed with the fabrication to meet field conditions.

C. The Contractor shall review all Contract Documents to determine exact location of all Work and verify spatial relationships of all the Work. Any question concerning said location or spatial relationships shall be submitted in a manner approved by the Owner.

D. Special locations for equipment, pipelines, ductwork, and other such items of the Work, where not dimensioned on plans, shall be coordinated with affected Other Contractors.

E. The Contractor shall be responsible for the proper fitting of the Work in place.

Section 3.03 - Surveys

Unless otherwise expressly provided in the Contract Documents, the Owner shall furnish the Contractor all surveys of the property necessary for the Work, but the Contractor shall lay out the Work.

ARTICLE 4 -- CONTRACTOR

Section 4.01 - Representations of Contractor

The Contractor represents and warrants:

A. That it is financially solvent and is experienced in and competent to perform the Work, and has the staff, workers, equipment, subcontractors, and suppliers to complete the Work within the time specified for the Contract amount.

B. That it is familiar with all federal, state, and local laws, codes, ordinances, orders, rules, and regulations which may affect the Work, the Contractor, or the Project.

C. That all temporary and permanent Work required by the Contract Documents can be satisfactorily constructed, and that said construction will not injure any person or damage any property.

D. That it has carefully examined the Contract Documents and the Site, and from the Contractor's own investigations is satisfied as to the nature and materials likely to be encountered, the character of equipment and other facilities needed for the performance of the Work, the general and local conditions, and all other materials or items which may affect the Work.

E. That it is satisfied that the Work can be performed and completed as required in the Contract Documents, and warrants that it has not been influenced by any oral statement or promise of the Owner or the Design Professional.

F. That to the best of Contractor's knowledge, there are no pending or threatened suits, proceedings, judgments, rulings, or orders by or before any court or any governmental agency or arbitrator that could reasonably be expected to affect materially and adversely:

1. the financial condition or operations of the Contractor;

2. the ability of the Contractor to perform its obligations hereunder; or

3. the legality, validity, or enforceability of this Contract.

G. That Contractor is a duly organized and validly existing entity of the type described in the recital clauses of the Agreement and is in good standing under the laws of the jurisdiction of its formation; it has the legal right, power, and authority and is qualified to conduct its business and to execute and deliver this Contract and perform its obligations under this Contract; and all regulatory authorizations have been obtained and will be maintained, as necessary, for it to perform legally its obligations under this Contract.

H. That executing and performing this Contract are within Contractor's powers; that executing and performing this Contract has been duly authorized by all necessary action on the Contractor's part; and that such actions do not and will not violate any provision of law or any rule, regulation, order, writ, judgment, decree, or other determination presently in effect applicable to Contractor or its governing documents.

I. That this Contract constitutes the Contractor's legal, valid, and binding obligation, enforceable against it in accordance with this Contract's terms, subject to applicable bankruptcy, insolvency, reorganization, and other laws affecting creditors' rights generally, and general equitable principles, to the discretion of the court before which proceedings to obtain the same may be pending.

J. That Contractor is in good standing with any union with craft labor on the Site for part or all the Work of this Contract or the work of the Project.

K. That Contractor is experienced in the methods of design, engineering, installation, management, and construction contemplated for the Work of this Contract and for contracts of this nature, scope magnitude and quality and that the Contractor understands the complexity involved in this type of Contract and the necessity to coordinate its Work with appropriate governmental agencies, the Owner, and the Other Contractors.

L. That Contractor is fully informed as to all existing conditions and limitations, including local workforce/labor working arrangements and the continuous, regular, and uninterrupted operations of the Facility.

M. That Contractor has had the opportunity to consult with or has consulted with legal counsel of its choice before entering in to this Contract.

N. That any breach of any of the representations and warranties of this General Conditions Section 4.01, any failure of the Contractor to familiarize itself with the Contract Documents, the Facility, the Site or the Project or any lack of knowledge on the part of the Contractor of any existing or foreseeable condition or conditions at the Site reasonably inferred from the Contract Documents which create difficulties or hindrances in the execution of the Work shall constitute a conclusive and binding determination by the Contractor that resolving any adverse impact of such breach, failure or lack of knowledge does not constitute Extra Work and a waiver by the Contractor of all Claims for additional

compensation or damages or time to achieve Substantial Completion as a result of the breach, failure or lack of knowledge.

Section 4.02 - Errors or Discrepancies

The Contractor shall examine the Contract Documents thoroughly before commencing the Work and report any errors or discrepancies to the Owner, in writing, within fifteen (15) calendar days of discovery. The Owner shall not be responsible for costs, damages or delays due to the Contractor's failure to comply with the requirements of this General Conditions Section 4.02.

Section 4.03 - Coordinated Composite Drawings

A. The Contractor shall prepare coordinated composite drawings clearly showing how the Work of the Contractor is to be performed in relation to the work of Other Contractors, prepare scaled drawings and sections in the same digital software program, version, and operating system as the original Contract Drawings or in an operating system approved by the Owner.

B. If, and only if, required by the Information for Bidders for the Contract, the Contractor shall run a conflicts and coordination check utilizing the Project Drawings within a three-dimensional software program of the Contractor's choice to limit the number of physical conflicts that may occur during construction. Failure to run such a conflicts and coordination check or to resolve conflicts and coordination issues identified as a result of such a check prior to the initiation of the Work on Site shall constitute a:

    1. conclusive and binding determination by the Contractor that resolution of the conflicts does not involve Extra Work; and

    2. waiver by the Contractor of all Claims for additional compensation, damages, or time to achieve Substantial Completion as a result of the existence of physical conflicts.

Section 4.04 - Meetings

The Contractor shall attend all meetings required by the Contract Documents and all meetings when directed to attend by the Owner. The Contractor shall be represented at all meetings by the on-Site superintendent described in General Conditions Section 4.05 A who shall attend the meetings in person unless the Owner in writing prior to the meeting directs otherwise. If the Owner directs, the Contractor shall be represented either by the project management personnel of General Conditions 4.05 B or by an authorized officer of Contractor; in each case, the project management personnel or the authorized officer shall attend the meetings in person. The Owner, in its sole and exclusive discretion, shall determine the time, date, location, and purpose of the meeting. The purpose of a meeting includes, but is not limited to, Project progress, submittal status, Change Orders, site logistics, coordination, inspections, testing, safety reviews, or anything which the Owner determines is useful for administration or performance of the Contract or the Project.

Section 4.05 - Supervision by Contractor

A. The Contractor shall provide full-time competent supervision for the duration of the Contract. During the course of on-Site Work, the Contractor shall provide a full-time on-Site superintendent who shall have full authority to act for the Contractor at all times. The superintendent shall read, write, and speak English fluently, as well as communicate with the Contractor's workers and the workers of all Subcontractors.

B. The Contractor shall also provide competent project management personnel in addition and superior to the full-time on-Site superintendent who shall also have full authority to act for the Contractor at all times except such project management personnel cannot modify or rescind any action of the full-time on-Site superintendent directed to the Owner without the Owner's written consent.

C. If at any time the supervisory staff is not satisfactory to the Owner, the Contractor shall, if directed in writing by the Owner, immediately replace such supervisory staff with other staff satisfactory to the Owner at no additional cost to the Owner.

D. The Contractor shall remove from the Work any employee of the Contractor or of any Subcontractor when so directed in writing by the Owner.

Section 4.06 – Project Scheduling

A. The Contractor shall provide a project scheduler, experienced in critical path method (CPM) scheduling. The scheduler's experience and credentials shall be submitted in writing to the Owner for review and acceptance prior to proceeding with scheduling of the Work. The Owner may withdraw its acceptance of the project scheduler at any time thereafter for failure to perform in accordance with the Contract. The Contractor shall provide a replacement scheduler and submit the replacement's experience and credentials in writing to the Owner for review and acceptance as soon as possible. The replacement scheduler shall be at no additional cost to the Owner.

B. Using the software required by the Owner, the Contractor shall prepare, maintain, and revise the Project CPM schedule to plan and monitor the progress of all Project operations, in accordance with the Contract Documents. See the General Requirements for further details.

C. Construction activities shall be interrelated on a single Project CPM schedule that represents the entire Project, including the entire Contract duration from Notice to Proceed to Substantial Completion and through Completion and Acceptance. The Contractor shall utilize the critical path method of network calculation to generate the Project CPM schedule and shall utilize the time-scaled precedence diagram method to show the Project CPM Schedule. The Project CPM Schedule shall utilize calendar days for the time scale. The Contractor shall ensure all logic constraints are identified between the Work of the Contract, the work of Other Contractors and Owner's work prior to approval of the Project CPM schedule. See the General Requirements for further details.

D. The Owner may reject any proposed Project CPM schedule, any proposed updated Project CPM schedule or any proposed recovery Project CPM schedule if the Owner, in its sole and exclusive discretion, finds the proposed Project CPM schedule, proposed updated Project CPM schedule or proposed recovery Project CPM schedule defective for any reason, including but not limited to:

    1. Defective logic;

    2. Excessive use of constraints;

    3. Activity durations that are inconsistent with actual or available workforce; or

    4. The appearance of an effort to manipulate the schedule so that responsibility for an adverse impact is associated with a natural person or entity other than the natural person or entity responsible for the adverse impact.

E. If a proposed Project CPM schedule, proposed updated Project CPM schedule or proposed recovery Project CPM schedule is rejected by the Owner, the Owner will notify the Contractor in writing of the rejection and the reason or reasons for the rejection. Contractor shall submit a new proposed Project CPM schedule, proposed updated Project CPM schedule or proposed recovery Project CPM schedule with the defect or defects corrected at no cost to the Owner within two weeks of the Owner's written rejection.

F. Review comments made by the Owner on the proposed Project CPM schedule, any proposed updated Project CPM schedule or any proposed recovery Project CPM schedule shall not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor shall be responsible for scheduling, sequencing, and performing the Work to comply with the requirements of the Contract Documents.

G. The Contractor expressly understands and agrees that no additional compensation shall be paid for any alterations to Contractor's planned construction sequence to accommodate the Project CPM schedule requirements, any updated Project CPM schedule or any recovery Project CPM schedule pursuant to the Contract. Failure to include any element of work required for the performance of the Work shall not excuse the Contractor from completing all the Work required within the applicable completion date of each phase in the Contract Documents regardless of the Owner's approval of the Project CPM schedule, any updated Project CPM schedule or any recovery Project CPM schedule.

H. The Owner may withhold payments if the Contractor fails to provide an acceptable project scheduler, replacement project scheduler, Project CPM schedule, updated Project CPM schedule, recovery Project CPM schedule or other schedule information or reports in accordance with requirements of the Contract.

Section 4.07 - Worker Identification and Site Access Control

A. All employees of the Contractor and every Subcontractor shall comply with all site access control and security procedures prescribed by the Owner which may include, but are not limited to, the wearing of Owner issued identification badges, ingress and egress through controlled entry and exit points, and use of card readers or other electronic identity verification devices. Contractor cannot authorize any one to enter the Site, except Contractor's and Subcontractor's employees and persons delivering materials or equipment to Contractor or a Subcontractor, without the prior written consent of the Owner.

B. All employees of the Contractor and every Subcontractor, prior to entering the Site for the first time, shall obtain an identification badge if issued by the Owner and produce to the Owner a valid form of government-issued photo identification and furnish other background information, including but not limited to the following:

Full Name
Last four (4) digits of Social Security Number
Home Address (#/Street/Apt./City/Zip)
Contractor/Subcontractor Name
Job Classification
Union Local Affiliation, if any

The Owner recognizes that certain information requested above constitutes personal information and will take all reasonable steps to ensure the security and confidentiality of this information as required by law.

C. All employees of the Contractor and every Subcontractor shall visibly display on their person, while entering and on the Site, an identification badge if issued by the Owner. In the event said identification badge has not been issued by the Owner, all employees of the Contractor and every Subcontractor shall produce a valid form of government-issued photo identification promptly upon request of the Owner. Failure to display such identification or to produce such identification in the manner as prescribed by the Owner may result in the employee's non-admittance to or immediate removal from the Site. The Owner will send written confirmation to the Contractor confirming the action taken, if requested by the Contractor.

Section 4.08 - Related Work

A. The Contractor should examine the Contract Documents for Work of its Contract and any related work of other contracts, to ascertain the relationship of its Work to any related work of other contracts.

B. The Owner may contract with a Design Professional, Construction Manager, or other Consultants to provide services to the Owner. The services enumerated in consultant contracts are for the benefit of the Owner who may choose to utilize any or all of said services. The Contractor has no privity of contract with the Design Professional, Construction Manager, or any other Consultant which contracts with the Owner and should not assume that all of the services enumerated in said contracts will be provided.

C. The Contractor shall adhere to all of the requirements specified or communicated by the Design Professional in performing delegated design work required by the Contract Documents.

Section 4.09 – Coordination with Separate Contracts

A. The Owner may award other contracts for work which may proceed simultaneously with the execution of the Work. The Contractor shall coordinate the Contractor's operations with those of Other Contractors as directed by the Owner. Cooperation shall be required in the arrangements for access, the storage of material, and in the detailed execution of the Work.

B. The Contractor shall take those steps reasonably necessary to keep itself informed of the progress and workmanship of Other Contractors and any subcontractors of Other Contractors and shall notify the Owner in writing immediately of lack of progress or defective workmanship on the part of Other Contractors or any subcontractors of Other Contractors, where said delay or defective workmanship may interfere with the Contractor's operations.

C. Failure of a Contractor to keep so informed and failure to give written notice of lack of progress or defective workmanship by Other Contractors or any subcontractors of Other Contractors shall be construed as acceptance by the Contractor of said progress and workmanship as being satisfactory for proper coordination with the Work.

D. Where the Contractor shall perform Work in close proximity to work of Other Contractors or any subcontractors of Other Contractors, or where there is evidence that Work of the Contractor may interfere with work of Other Contractors or any subcontractors of Other Contractors, the Contractor shall assist in arranging space conditions to make satisfactory adjustment for the performance of the Work. If the Contractor performs Work in a manner that causes interference with the work of Other

Contractors or any subcontractors of Other Contractors, the Contractor shall make changes necessary to correct the condition at no additional cost to the Owner.

E. The Contractor shall render any assistance which the Owner may require with respect to any claim or action in any way relating to the Work including, without limitation, review of claims, preparation of technical reports and participation in negotiations, without any additional compensation therefor.

Section 4.10 - Cooperation with Other Contractors

A. During the performance of the Work, Other Contractors may be engaged in performing work. The Contractor shall coordinate the Contractor's Work with the work of said Other Contractors in such a manner as the Owner may direct.

B. If the Owner determines that the Contractor is failing to coordinate the Work with the work of Other Contractors as the Owner has directed:

1. The Owner shall have the right to withhold any payments due under the Contract until the Contractor complies with the Owner's direction; and

2. The Contractor shall assume the defense and pay on behalf of the Owner any and all claims or judgments or damages and any costs to which the Owner may be subjected or which the Owner may suffer or incur by reason of the Contractor's failure to promptly comply with the Owner's directions, including, but not limited to attorney's fees, expert fees, and costs. Notwithstanding the foregoing, the Owner retains the right to select its own counsel for such defense, the cost of which is to be paid by the Contractor.

C. If the Contractor notifies the Owner, in writing, that an Other Contractor on the Site is failing to coordinate its work with the Work, the Owner shall investigate the charge. If the Owner finds it to be true, the Owner shall promptly issue such directions to the Other Contractor with respect thereto as the situation may require. The Owner shall not be liable for any damages suffered by the Contractor by reason of the Other Contractor's failure to promptly comply with the directions so issued by the Owner, or by reason of an Other Contractor's default in performance.

D. Should the Contractor sustain any damage through any act or omission of any Other Contractor having a contract with the Owner or through any act or omission of any subcontractor of said Other Contractor, the Contractor shall have no Claim against the Owner for said damage.

E. Should any Other Contractor having or which shall have a contract with the Owner sustain damage through any act or omission of the Contractor or through any act or omission of a Subcontractor, the Contractor shall reimburse said Other Contractor for all said damages and shall indemnify and hold the Owner harmless from all such claims by said Other Contractor, including, but not limited to attorney's fees, expert fees, and costs. Notwithstanding the foregoing, the Owner retains the right to select its own counsel for such defense, the cost of which is to be paid by the Contractor. The Owner's right to indemnification hereunder shall in no way be diminished, waived, or discharged, by its recourse to assessment of liquidated damages as provided in the Contract Documents, or by the exercise of any other remedy provided by the Contract or law.

F. The Owner cannot guarantee the responsibility, efficiency, unimpeded operations, or performance of any contractor. The Contractor acknowledges these conditions and shall bear the risk of all delays including, but not limited to, delays caused by the presence or operations of Other Contractors and

subcontractors of Other Contractors and delays attendant upon any Project CPM schedule approved by the Owner and the Owner shall not incur any liability by reason of any delay.

ARTICLE 5 -- MATERIALS AND LABOR

Section 5.01 - Contractor's Obligations

A. The Contractor shall, comply with all the terms of the Contract Documents and complete all the Work in a good worker like manner, within the time specified in the Contract and to the satisfaction of the Owner.

B. The Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, permits, insurance, temporary structures and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent, and whether incorporated or to be incorporated in the Work or not incorporated in the Work.

C. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

D. Any labor, materials or means whose employment, or utilization during the course of the Contract may tend to or in any way cause or result in strike, work stoppages, delays, suspension of Work or similar troubles by workers employed by the Contractor, its Subcontractors or material suppliers, or by any of the trades working in or about the Site, or by Other Contractors, their subcontractors or material suppliers pursuant to other contracts shall not be allowed. Any violation by the Contractor of this requirement may in the sole judgment of the Owner be considered a default by the Contractor under the Contract and a basis for the Owner to take action against the Contractor as set forth in General Conditions Article 11 – Termination or Suspension or such other action as the Owner may deem proper.

E. The Contractor and each Subcontractor shall comply with all applicable local, state, and federal laws, rules and regulations and all applicable construction standards issued by the Joint Commission and other accrediting agencies and organizations.

F. The Contractor and each Subcontractor shall comply with all applicable Hazardous Material Laws. The Contractor shall provide the Owner the Safety Data Sheets for any Hazardous Materials or hazardous substances brought on the Site by the Contractor or a Subcontractor at least fifteen (15) calendar days prior to the delivery of such materials to the Site. Contractor shall identify to Owner at least fifteen (15) calendar days in advance the quantities of all "Chemicals of Interest" listed under the Chemical Facility Anti-Terrorism Standards of the Homeland Security Appropriations Act of 2007 that will be brought onto the Site.

G. Contractor shall provide the necessary information and training to its employees on each Hazardous Material and hazardous substance to which they may be exposed on the Site and shall cause each of its Subcontractors to provide the necessary information and training to the Subcontractor's employees on each Hazardous Material and hazardous substance to which they may be exposed on the Site. Upon request of the Owner, Contractor shall provide the Owner with proof, satisfactory to the Owner, that Contractor's employees and all Subcontractors' employees have received the necessary information and training.

H. Contractor shall not transport, store or use, and shall prohibit Subcontractors from transporting, storing or using, any construction materials or equipment (whether or not totally enclosed) containing Hazardous Materials including, but not limited to, asbestos, polychlorinated biphenyls, benzene, lead or urea formaldehyde in connection with this Contract; provided, however, Contractor and Subcontractors may transport, store and use the following substances: lead, natural gas, gasoline, diesel fuel, fuel oil(s), gravel(s), lube oil(s), grease(s), sealant(s), combustible gases, form oil(s), solvent(s), adhesives, paints, coatings, and all other materials that are used or consumed in or during construction or testing of the Work and its constituent systems and components in quantities reasonably necessary to perform the Work, if transported, stored and used in accordance with applicable laws including, but not limited to, those laws related to the implementation and utilization of spill containment, transport systems and storage vessels and facilities.

I. Any Hazardous Materials and hazardous substances brought to or stored on or at the Site shall require specific, prior written authorization from Owner and, as a condition to such authorization, Contractor shall provide Owner with the Material Safety Data Sheet covering any Hazardous Material or hazardous substance furnished under or otherwise associated with the Work (including the construction equipment). Contractor shall maintain on the Site, at all times, complete records, and inventories, including Safety Data Sheets, of Hazardous Materials and hazardous substances described in this General Conditions Section 5.01 that are being used by it or its Subcontractors, or any persons for whose actions on the Site Contractor is responsible.

Section 5.02 - Means and Methods of Construction

A. Unless otherwise provided in the Contract Documents, the Contractor shall choose the Means and Methods of Construction subject to the Owner's right to reject, at any time, the Means and Methods of Construction proposed by the Contractor, which in the opinion of the Owner:

1. Will constitute or create a hazard to the Work or to persons or property;

2. Will not produce finished Work in accordance with the terms of the Contract;

3. Will be detrimental to the overall progress of the Project; or

4. Will have an adverse impact on the operations of the Client.

B. The Owner's failure to exercise its right to reject the Contractor's Means and Methods of Construction shall not relieve the Contractor of its obligation to complete the Work; the Owner's exercise of its right to reject the Contractor's Means and Methods of Construction shall not create a Contractor's or Subcontractor's cause of action for damages against the Owner.

Section 5.03 - Contractor's Title to Materials

A. No materials for the Work shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by any other party. The Contractor warrants that the Contractor has full, good, and clear title to all materials used by the Contractor in the Work, or resold to the Owner pursuant to the Contract Documents free from all liens, claims or encumbrances.

B. For all materials and equipment to be stored at a location other than the Site prior to execution of an agreement with the Owner for materials stored off-site pursuant to General Conditions Section 8.01 G,

the Contractor shall provide the Owner with written notice of the location, security, environmental protections and the materials or equipment to be stored at that location at least fifteen (15) calendar days before such storage begins. Such notice does not obligate the Owner to pay for such stored material or equipment. Payment for stored material or equipment can be made only when the requirements for such payment in General Conditions Article 8 - Payment and elsewhere in the Contract have been met.

C. All materials, equipment and articles which become the property of the Owner shall be new unless specifically stated otherwise.

Section 5.04 - Comparable Products ("Or Equal" Clause)

A. Whenever a material, article or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalogue number, or make, said identification is intended to establish a standard. Any material, article or equipment of other manufacturers and vendors which performs satisfactorily the duties imposed by the design intent may be considered equally acceptable provided that, in the opinion of the Design Professional, the material, article, or equipment so proposed is of equal quality, substance and function and the Contractor shall not Provide, Furnish or Install any said proposed material, article, or equipment without the prior written approval of the Design Professional. The burden of proof and all costs related thereto concerning the "or equal" nature of the substitute item, whether approved or disapproved, shall be borne by the Contractor.

B. Any costs savings to an approved comparable product realized by the Contractor shall be shared equally between the Owner (50%) and Contractor (50%).

C. Where the Design Professional, pursuant to the provisions of this General Conditions Section 5.04, approves in writing a product proposed by the Contractor and said proposed product requires a revision of the Work covered by this Contract, or the work covered by other contracts, all changes in the work of all contracts, revision or redesign, and all new Drawings and details required therefore shall be provided by the Contractor at its cost and shall be subject to the approval of the Design Professional.

D. No substitution which may result in a delay to the Project will be permitted without the prior written approval of the Owner.

Section 5.05 - Quality, Quantity and Labeling

A. The Contractor shall Furnish materials and equipment of the quality and quantity specified in the Contract.

B. When materials are specified to conform to any standard, the materials delivered to the Site shall bear manufacturer's labels stating that the materials meet said standards. Contractor’s quality control plan required by paragraph D of this General Conditions Section 5.05 shall include measures undertaken by the Contractor to prevent the use of materials with counterfeit labels or other counterfeit indications of meeting a standard.

C. The above requirements shall not restrict or affect the Owner's right to test materials as provided in the Contract.

D. The Contractor shall develop and implement quality control plans to assure itself and the Owner that all Work performed by the Contractor and its Subcontractors complies fully with all Contract

requirements, and shall submit the plans to the Owner as required by the Contract. See the Submittals Section of the General Requirements for further details. The Contractor's quality control plans shall be independent of any testing or inspection performed by or on behalf of the Owner.

Section 5.06 - Tax Exemption

A. The Owner is exempt from payment of federal, state, and local taxes; sales and compensating use taxes of the State of New York and of cities and counties on all materials and supplies incorporated in to the completed Work. These taxes are not to be included in bids. This exception does not apply to tools, machinery, equipment or other property leased by or to the Contractor or a Subcontractor, or to supplies and materials which, even though they are consumed, are not incorporated in to the completed Work, and the Contractor and Subcontractors shall be responsible for and pay any and all applicable taxes, including sales and compensating use taxes, on said leased tools, machinery, equipment or other property and upon all said unincorporated supplies and materials.

B. The Contractor and Subcontractors shall obtain any and all necessary certificates or other documentation from the appropriate governmental agency or agencies, and use said certificates or other documentation as required by law, rule, or regulation.

ARTICLE 6 -- SUBCONTRACTS

Section 6.01 - Subcontracting

A. The Contractor may utilize the services of Subcontractors, subject to the limits prescribed in the Information for Bidders Section 7.0 – Approval of Subcontractors/Subcontract Limits. Exceeding stated limits, without prior written approval by the Owner, may be cause for Contract termination.

B. The Contractor shall submit to the Owner the name of each proposed Subcontractor as required by the Contract. The Owner reserves the right to disapprove any proposed Subcontractor and such disapproval shall not result in any additional cost to the Owner. If requested by the Owner, the Contractor shall provide copies of any and all Subcontracts and purchase order agreements related to the Work. The Contractor shall require each Subcontractor to provide the Owner, upon the Owner’s request, with a copy of each of the Subcontractor’s subcontracts and purchase order agreements related to the Work.

C. The Contractor's use of Subcontractors shall not diminish the Contractor's obligation to complete the Work. The Contractor shall control and coordinate the Work of Subcontractors and be fully responsible for the acts and omissions of Subcontractors, and of persons either directly or indirectly employed by Subcontractors. The Contractor shall be responsible for all guarantees and warranties provided by Subcontractors.

D. The Contractor shall be responsible for requiring each Subcontractor, to extent of the Work to be performed by such Subcontractor, to be bound to the Contractor by all the terms, conditions, and requirements of the Contract Documents, and to assume towards the Contractor all the obligations and responsibilities which the Contractor, by the Contract Documents, assumes toward the Owner. The Contractor shall cause each Subcontractor to receive and review the provisions of the Contract Documents applicable to the Subcontractor, including but not limited to a copy of the Payment Bond for this Contract. Upon request of the Owner, the Contractor shall provide written proof satisfactory to the Owner that each Subcontractor has received and reviewed the provisions of the Contract Documents applicable to such Subcontractor, including but not limited to, a copy of the Payment Bond for this Contract.

E. The Contractor shall ensure that each Subcontractor's duties to procure insurance for, and to defend, indemnify and hold harmless the Owner and Client, are, to the fullest extent permitted by law, at least the same as the Contractor's duties to procure insurance for, and to defend, indemnify and hold harmless the Owner and Client.

F. To the fullest extent permitted by law and independent of any duty to indemnify and hold harmless, the Contractor shall require each Subcontractor, to the fullest extent permitted by law, to defend the Owner and Client against claims by third persons for wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising out of or alleged to arise out of or as a result of or in connection with the performance of the Work, whether actually caused by or resulting from the performance of the Work, or out of or in connection with the Subcontractor's operations or presence at, or in the vicinity of, the Site.

G. To the fullest extent permitted by law, the Contractor shall require each Subcontractor, to the fullest extent permitted by law, to indemnify and hold harmless the Owner and Client against claims by third persons for wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising out of or alleged to arise out of or as a result of or in connection with the performance of the Work, whether actually caused by or resulting from the performance of the Work, or out of or in connection with the Subcontractor's operations or presence at, or in the vicinity of, the Site.

H. The Contractor shall require each Subcontractor, in addition to the Subcontractor's other obligations, to pay the costs of the Owner and Client, including but not limited to, attorneys' and consultants' fees, expenses and court costs, to commence and prosecute a court action against the Subcontractor to enforce one or more of the Subcontractor's obligations under General Conditions Section 6.01 E, F or G or against an insurance company to obtain coverage under an insurance policy which the Subcontractor represented would provide coverage to the Owner or Client.

I. Nothing contained in the Contract or any subcontract shall create any contractual relationship between any Subcontractor and the Owner except the requirements in General Conditions Sections 15.03 and 15.04 for each Subcontractor to procure insurance policies on which the Owner or the Owner and Client are insureds, the obligations of each Subcontractor pursuant to General Conditions Section 6.01 E, F and G to defend, indemnify and hold harmless, to the fullest extent permitted by law, the Owner and Client against claims by third persons for wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever and the obligation of each Subcontractor pursuant to General Conditions Section 6.01 H.

J. In selecting a Subcontractor, the Contractor shall consider whether the proposed Subcontractor appears on any list of entities debarred or suspended from doing business with a government entity, including the current list of companies or individuals that have been declared ineligible to receive Federal contracts published by the System for Award Management. The Contractor shall not Subcontract with any entity on the List of Employers Ineligible To Bid On Or Be Awarded Any Public Contract, published by the NYS Department of Labor Bureau of Public Work. The Contractor shall not Subcontract with any entity on the debarment list published by the NYS Workers' Compensation Board pursuant to Section 141-b of the NYS Workers' Compensation Law.

K. Prior to or after award of the Contract, if requested by the Owner, the Contractor shall require a Subcontractor to submit a NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) and a Dormitory Authority DASNY Vendor Questionnaire. If requested by the Owner, the Contractor shall require a Subcontractor to update a NYS Vendor Responsibility Questionnaire For Profit

Construction (CCA-2) and a Dormitory Authority DASNY Vendor Questionnaire previously submitted to the Owner.

L. The Contractor shall submit a NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) and a Dormitory Authority DASNY Vendor Questionnaire to the Owner for each Subcontractor proposed for the Work with a subcontract value of two million dollars ($2,000,000) or greater. Refer to General Conditions Article 19 – Executive Order No. 125.

M. After execution of the Contract, the Owner will provide to the Contractor copies of the Owner's Code of Business Ethics Certification form. The Contractor is required to have each Subcontractor, at all tiers, complete the form prior to the Subcontractor beginning work. The completed forms are to be filed by the Contractor with the Owner. A failure to comply with this requirement may result in the Subcontractor(s) being removed from the Project Site.

ARTICLE 7 -- CHANGES IN THE WORK

Section 7.01 - Changes

A. Without invalidating the Contract, the Owner, in writing, may order changes in the Work by altering, adding to, or deducting from the Work of the Contract.

1. No change in the Work is effective unless the Owner executes and delivers a Change Order to the Contractor. No payment for a change in the Work is due the Contractor unless and until a Change Order is executed and delivered by the Owner to the Contractor and the Contractor has performed the change in the Work. No alteration to the standard language of the Owner's Change Order form shall be accepted. If the Contractor requests an adjustment to the Substantial Completion date for a change in the Work and the Owner agrees, an increase or decrease to the duration, in calendar days, shall be included in the Change Order.

2. Notwithstanding subparagraph 1, the Owner, at its discretion, may execute and deliver to the Contractor a Notice to Proceed directing the Contractor to proceed immediately and diligently with the change in the Work described in the Notice to Proceed. The Owner, upon execution and delivery of the Notice to Proceed to the Contractor, is obligated to adjust the Contract for the change in the Work described in the Notice to Proceed; the extent of the adjustment(s) will be determined using the method of General Conditions Section 7.01 B specified in the Notice to Proceed, this General Conditions Article and negotiations with the Contractor; the adjustment(s) will be stated in the Change Order to be executed and delivered by the Owner to the Contractor. The Contractor, upon receipt of the Notice to Proceed, is obligated to proceed immediately and diligently with the change in the Work described in the Notice to Proceed while the adjustment(s) are determined. The Notice to Proceed shall be processed through the Project Management Program prior to execution and delivery by the Owner to the Contractor. No alteration to the standard language of the Owner's Notice to Proceed form shall be accepted. No payment for the change in the Work is due the Contractor until the Change Order is executed and delivered by the Owner to the Contractor and the Contractor has performed the change in the Work. The Owner determines the duration between execution and delivery of the Notice to Proceed and execution and delivery of the Change Order.

3. Contractor's failure to proceed immediately and diligently with any Notice to Proceed or Change Order executed and delivered by the Owner to the Contractor, unless the Owner in writing directs otherwise, shall be a material breach of the Contract.

4. If, after the Owner has executed and delivered a Notice to Proceed to the Contractor for a change in the Work, the Owner and the Contractor cannot agree on the adjustment(s) to the Contract for the change in the Work described in such Notice to Proceed, the Owner shall execute and deliver a Forced Change Order to the Contractor in an amount and with such other provisions that the Owner considers to be fair and reasonable for the change in the Work described in such Notice to Proceed and Forced Change Order. If the Contractor does not accept the Forced Change Order, the Contractor shall strictly comply with the requirements of General Conditions Section 7.01 D.

5. No Change Order is executed by the Owner unless and until the Change Order is processed through the Project Management Program and:

    a. For a Change Order for an amount less than $5,000, the regional project manager, the chief project manager, or the director – construction, for the Project signs the Change Order;

    b. For a Change Order for an amount of $5,000 to $150,000, the director - construction administration, the chief - project controls, or the senior managing director – construction signs the Change Order; and

    c. For a Change Order for more than $150,000, the managing director - construction or other authorized officer of Owner signs the Change Order;

    d. Notwithstanding the preceding provisions of this subparagraph, a Change Order which modifies the date for Substantial Completion and has a monetary amount less than $5,000 shall be executed as a Change Order of $5,000 to $150,000.

    e. No Change Order delivered to the Contractor is valid unless the Change Order has been executed in accordance with this subparagraph. The Owner, by written notice to the Contractor, may add or delete employees from the list of employees authorized to sign for the Owner a category of Change Orders and may limit an employee's authorization to sign a Change Order to part of a category. Notwithstanding any other provision of the Contract, the written notice adding an employee to the list of employees authorized to sign for the Owner a category of Change Orders and the written notice limiting an employee's authorization to part of a category may be put on one or more Change Orders for the Contract.

B. The Contract amount may be increased or decreased only by a Change Order and the amount of the adjustment is determined by one or more of the following methods, as determined by the Owner:

1. By applying the applicable unit price or prices contained in the Contract Documents, or negotiated pursuant to the provisions of this General Conditions Article. Unit prices are limited to the quantities specified in the Contract Documents or prior Change Order. Unit prices for quantities greater than specified in the Contract Documents or prior Change Order may, in the Owner's sole and exclusive discretion, be subject to negotiations between the Owner and Contractor.

2. By estimating the fair and reasonable cost of the change in the Work or deleted Work.

3. By determining the actual cost of the change in the Work and considering the following:

    a. Labor, including all wages and required wage supplements, paid to employees below the rank of superintendent directly employed at the Site for the change in the Work. Minimum wages are the prevailing rate of wages defined by the NYS Department of Labor. Actual wages in excess, paid by the Contractor, may be considered by the Owner.

b. Premiums or taxes paid by the Contractor for worker's compensation insurance, unemployment insurance, FICA tax and other payroll taxes as required by law, net of actual and anticipated refunds and rebates.

c. Materials associated with the change in the Work.

d. Equipment, excluding hand tools, which in the judgment of the Owner, would have been or will be employed in the Work. The Owner may employ the use of rental rates it deems most appropriate from the information in the "Equipment Watch Retail Rental and Equipment Watch Cost Recovery" databases. In no case will the equipment rental cost exceed the purchase price of the equipment. Self-owned equipment is defined to include equipment rented from Contractor-controlled or affiliated companies. It is the duty of the Contractor to utilize either rented or self-owned equipment that is of a nature and size appropriate for the Work to be performed. The Owner reserves the right to determine reasonable and appropriate equipment sizing, and at the Owner's discretion, it may adjust the costs allowed to reflect a smaller or less elaborate piece of equipment more suitable for performance of the change in the Work. The Owner, in its sole and exclusive discretion, will determine if equipment is rented from a company controlled by or affiliated with the Contractor.

e. To determine the daily and hourly rate of self-owned equipment, the monthly rate shall be divided by twenty-two (22) to establish a daily rate; or by one hundred and seventy-six (176) to establish the hourly rate. The operating cost listed in the "Equipment Watch Retail Rental and Equipment Watch Cost Recovery" databases would be added to this rate to establish the billable rate.

C. For each change in the Work, the Contractor shall submit to the Owner, within the time period provided by the Owner, the following information:

1. A detailed proposal of labor, material, and equipment costs for the change in the Work. The Contractor and Subcontractors shall use the Owner's Contractor and Subcontractor Change Order Proposal Forms, which are available directly from the Owner or from the Dormitory Authority's website http://www.dasny.org.

2. The Contractor's and Subcontractor's proposals shall provide a notarized statement as follows:

"I hereby certify that the value for the labor, material and equipment that comprise the proposal, represents the value of said work, material and equipment for the work performed or to be performed, pursuant to the Contract between the undersigned and the Dormitory Authority and that no overhead or profit is included in the proposal for a change to the Work performed by any Subcontractor or for any major equipment or material supplier that is a subsidiary or an affiliate of this firm."

3. Signed and notarized Labor Rate Worksheet to determine hourly rates for each classification of worker associated with the change in the Work. The Contractor shall use the Owner's Labor Rate Worksheets, which are available directly from the Owner or from the Dormitory Authority's website http://www.dasny.org. Only hourly rates for each classification of worker approved by the Owner can be used to determine the adjustment of the Contract amount for a Change Order. Only an authorized officer of Owner or authorized employee of Owner's Project Controls Unit can approve Labor Rate Worksheets.

4. Narrative and fragnet schedule, which describes the impact on the Project CPM schedule in calendar days associated with the change in the Work if the Contractor requests a change in the date to achieve Substantial Completion. Owner, in its sole and exclusive discretion, may waive, in writing, this requirement for requests to change the date to achieve Substantial Completion made prior to the Owner's approval of the initial Project CPM schedule. Owner's waiver of this requirement can be made only by an authorized officer of Owner or authorized employee of Owner's Project Controls Unit. If the Contractor does not submit a narrative and fragnet schedule, the Contractor acknowledges that the Change Order does not require a change in the date to achieve Substantial Completion.

5. The Contractor agrees to provide, at the Owner's request, any additional documentation to further verify labor, material, equipment, and any other cost sought for a change in the Work.

6. The Contractor agrees to provide, at the Owner's request, written justification for a change in the Work.

D. Each Contractor's written change proposal shall be reviewed by the Owner consistent with the requirements of the Contract.

1. Owner and Contractor shall negotiate in good faith to agree on the adjustment(s) to the Contract for each change in the Work. The Owner is not required to respond to any change proposal submitted by the Contractor until the Contractor submits a change proposal that complies with the Contract Documents. Negotiations under this General Conditions Article shall not impact the Project schedule. The Contractor's proposal for a change in the Work is approved and accepted by the Owner only by the Owner's execution and delivery of a Change Order to the Contractor. See General Conditions Section 7.01 A. 5 for the requirements of execution and delivery.

2. If the Owner has executed and delivered a Notice to Proceed to the Contractor for a change in the Work and the Owner and the Contractor cannot agree on the adjustment(s) to the Contract for the change in the Work described in such Notice to Proceed, the Owner shall execute and deliver a Forced Change Order to the Contractor in an amount and with such other provisions that the Owner considers to be fair and reasonable for the change in the Work described in such Notice to Proceed and Forced Change Order. If the Contractor does not accept the Forced Change Order, the Contractor shall file a notice of Claim in strict accordance with General Conditions Section 10.03 and comply strictly with all requirements of General Conditions Sections 10.03, 10.05 and 10.06. The Contractor's failure to comply with any or all of General Conditions Sections 10.03, 10.05 and 10.06 shall be deemed to be:

   a. a conclusive and binding determination on the part of the Contractor to accept the Forced Change Order as final, binding and conclusive on the Contractor; and

   b. a waiver by the Contractor of all Claims for additional compensation or damages as a result of the Forced Change Order.

E. Any information representing the value of the Work performed, materials supplied and equipment utilized contained in the Contractor's and Subcontractor's proposals that constitutes False Representation may subject the Contractor or Subcontractor to criminal charges, including NYS Penal Law Sections 175.35 (Offering a False Instrument for Filing) and 210.40 (False Statement) and/or Title 18 U.S.C. Sections 1001 (Fraudulent and False Statements) and/or termination of the Contract for cause and civil prosecution under Article XIII of the NYS State Finance Law – the New York False Claims Act.

F. The compensation specified in the Change Order executed by the Owner and delivered to the Contractor includes full compensation for the changes in the Work covered thereby, and the Contractor waives all rights to any other compensation, damages, or expenses for the changes in the Work described therein.

G. The Contractor shall furnish satisfactory bills, certified payrolls, vouchers, and other cost documentation covering all items of cost and when requested by the Owner shall give the Owner access to all accounts and records relating thereto, including records of Subcontractors and material suppliers.

H. At Substantial Completion, the Owner may address increased Project-specific bonding, liability insurance and builder's risk insurance costs which may have resulted from changes in the Work. The Contractor shall provide satisfactory proof of and paid invoices, including cancelled checks or bank statements showing payment, for such increased costs. The Owner will not pay overhead and profit on any increased costs for bonding, liability insurance or builder's risk insurance.

I. General Conditions Section 10.01 applies when the Owner determines that a decision, response, direction, action, omission, or condition does not require performance of Extra Work.

Section 7.02 - Overhead and Profit

A. See Example A for changes in the Work performed directly by the Contractor, whether a base cost is arrived at by estimated cost or actual cost method; add to base cost a sum equal to twenty percent. See Exceptions - Paragraphs "D" and "E".

Example A:

Contractor base cost	$1,000
20% overhead and profit	200
Total	$1,200

B. See Example B for changes in the Work performed by a Subcontractor under contract with the Contractor, where estimated or actual cost is Ten Thousand Dollars ($10,000.00) or less; add to the base cost a sum equal to twenty percent of cost, for the benefit of the Subcontractor. For the benefit of the Contractor; add an additional sum equal to ten percent of the Subcontractor's base cost.

Example B:

Subcontractor base cost	$1,000
20% Subcontractor overhead and profit	200
Subcontractor Total	$1,200
10% Contractor overhead and profit on base cost	100
Total	$1,300

C. See Example C for changes in the Work performed by a Subcontractor, under contract with the Contractor, which exceeds a base cost of Ten Thousand Dollars ($10,000) in estimated or actual cost; add to the base cost a sum equal to twenty percent of cost for the benefit of the Subcontractor. For the benefit of the Contractor; add an additional sum equal to ten percent of the first Ten Thousand Dollars ($10,000) of the Subcontractor's base cost, plus five percent of the next Ninety Thousand Dollars ($90,000) of the Subcontractor's base cost, plus three percent of any sum in excess of One Hundred Thousand Dollars ($100,000) of the Subcontractor's base cost.

Example C:

Subcontractor base cost	$200,000
20% Subcontractor overhead and profit	40,000
Subcontractor Total	$240,000
10% Contractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Total	$248,500

D. See Example D for overhead and profit on major equipment such as: switchgear, transformers, air handling units, boilers, etc. For extra equipment purchases by the Contractor or Subcontractors which exceeds a base cost of Ten Thousand dollars ($10,000) in estimated or actual cost; add to the base cost for the benefit of the Contractor a sum equal to ten percent of the first Ten Thousand dollars ($10,000) of the vendor's base cost plus five percent of the next Ninety Thousand dollars ($90,000) of the vendor's base cost, plus three percent of any sum in excess of One Hundred Thousand dollars ($100,000) of the vendor's base cost. If the equipment is supplied by the Subcontractor, the Contractor is entitled to a maximum of ten (10) percent of the first Ten Thousand dollars ($10,000) of the base cost.

Example D:

Vendor base cost	$200,000
10% Contractor or Subcontractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Contractor or Subcontractor Total	$208,500
10% Contractor overhead and profit on first $10,000 base cost when equipment is supplied by the Subcontractor, no other mark-up allowed	1,000
Total	$209,500

E. See Example E for overhead and profit on a material only Change Order. For increased material purchases by the Contractor or Subcontractors which exceed a base cost of Ten Thousand dollars ($10,000) in estimated or actual costs; add to the base cost for the benefit of the Contractor a sum equal to ten percent of the first Ten Thousand dollars ($10,000) of the supplier's cost plus five percent of the next Ninety Thousand dollars ($90,000) of the supplier's cost, plus three percent of any sum in excess of One Hundred Thousand dollars ($100,000) of the supplier's cost. If the material is supplied by the Subcontractor, the Contractor is entitled to a maximum of ten (10) percent of the first Ten Thousand dollars ($10,000) of the base cost.

Example E:

Material cost (net difference between original contract and revised)	$200,000
10% Contractor or Subcontractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Contractor or Subcontractor Total	$208,500
10% Contractor overhead and profit on first $10,000 base cost when material is supplied by the Subcontractor, no other mark-up allowed	1,000
Total	$209,500

F. Other than the overhead and profit described in General Conditions Section 7.02A, no further overhead and profit will be allowed for changes to the Work performed by a Subcontractor under Subcontract with the Contactor or for major equipment or material supplier determined to be an affiliate of or controlled by the Contractor. An affiliate is considered any firm or entity in which the Contractor or any individual listed on the Contractor's NYS Vendor Responsibility Questionnaire either owns 5% or more of the shares of, or is one of the five largest shareholders, a director, officer, member, partner or proprietor of said Subcontractor, major equipment or material supplier; a controlled firm is any firm or entity which, in the opinion of the Owner, is controlled by the Contractor or any individual listed on the Contractor's NYS Vendor Responsibility Questionnaire.

   1. The Owner, in its sole and exclusive discretion, will determine if a firm or entity is an affiliate of or controlled by the Contractor.

G. No overhead and profit shall be paid for changes in the Work performed by a Subcontractor not under Subcontract with the Contractor. No overhead and profit shall be paid on the premium portion of overtime pay. Where the changes in the Work involve both an increase and a reduction in similar or related Work, the overhead and profit allowance shall be applied only to the cost of the increase that exceeds the cost of the reduction.

Section 7.03 - Deduct Change Order

The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a decrease in the Contract amount shall be as determined by the Owner. The credit shall include the overhead and profit allocable to the deleted or changed Work unless the Owner, in its sole and exclusive discretion, determines otherwise.

ARTICLE 8 -- PAYMENT

Section 8.01 - Provision for Payment

A. The Contractor shall complete and submit to the Owner for review and written approval, the detailed Schedule of Values prior to the Contractor's first billing request. It is understood, and the Contractor acknowledges, that the Schedule of Values is an administrative tool to illustrate a format and minimum level of detail required for billing requests, and shall not be considered as delineating the Contractor's scope of Work. The Owner may require the Contractor to revise its Schedule of Values at no cost to the Owner and to provide a greater level of detail. Further, the Owner reserves the right to accept only those cost distributions which, in the Owner's opinion, are reasonable, equitably balanced and correspond to the estimated quantities in or for the Contract Documents. Owner's approval of the Schedule of Values can be provided only by an authorized officer of Owner or authorized employee of Owner's Project Controls Unit.

   The Contractor, at its own expense, shall take all actions necessary to fully comply with the requirements of the Statewide Utilization Management Plan ("SUMP") of the NYS Contract System. Contractor shall require all Subcontractors to comply with the requirements of SUMP and the NYS Contract System. These requirements include, but are not limited to, the Contractor's timely payment to all Subcontractors and timely input in to the NYS Contract System of information, including but not limited to, information regarding Subcontractor payments and compliance with Contract requirements, including but not limited to Contract requirements for participation of Minority and Women Owned Business Enterprises in the performance of the Contract.

B. The Owner shall not approve any billing request until:

1. the Contractor is in full compliance with SUMP and the NYS Contract System; and

2. the Owner approves the Schedule of Values in writing.

C. To request a partial or full payment for partial or full performance of the Contract, Contractor shall obtain from the Owner a Contractor's billing request. The Contractor shall complete the billing request by entering in each line item thereof the percentage of completion of that item as of the end of the preceding business month and deliver the completed billing request to the Owner. The Owner shall review the billing request and make any changes which the Owner, in its sole and exclusive discretion, determines to be necessary so that the percentage of completion for each line item in the billing request accurately reflects the Contractor's performance of the Contract as of the end of the preceding business month. The Owner then delivers the Owner's adjusted version of the billing request to the Contractor for execution by the Contractor of the certifications of the Contractor required for partial or full payment for partial or full performance of the Contract. The Contractor delivers the executed billing request to the Owner. Any partial payment request under the Contract shall be at least thirty (30) calendar days after the preceding partial payment request under the Contract, unless the Owner in writing signed by an authorized officer permits more frequent requests.

D. The Owner may make a partial payment to the Contractor for partial performance of the Contract on the basis of an Application for Payment for the Work performed during the preceding business month. The Owner shall retain five percent (5%) of the amount of each said Application for Payment. The Owner may make full payment to the Contractor for full performance of the Contract on the basis of an Application for Payment. Each Application for Payment shall be accompanied by all documentation required by law, including but not limited to, certified payrolls and all documentation required by the Owner, including but not limited to documentation to establish compliance with NYS Labor Law and NYS Lien Law. The Owner may require any documentation the Owner determines is necessary or useful to establish that the Contractor's performance of the Work complies with the requirements of the Contract and applicable law.

E. Any partial payment made shall not be construed as a waiver of the right of the Owner to require the fulfillment of all the terms of the Contract. No payment, either partial or full, by the Owner to the Contractor shall waive or excuse any failure by the Contractor to comply fully with the Contract Documents. No payment will be made for Work not performed.

F. In preparing the Contractor's billing request, material delivered to the Site and properly stored and secured at the Site and material approved to be stored off-site under such conditions as the Owner shall prescribe in accordance with paragraph G of this General Conditions Section 8.01, may be taken in to consideration. All costs related to the storage of materials are the sole responsibility of the Contractor.

G. The Owner will provide an agreement for materials stored off-site and specific forms that the Contractor shall complete, execute, and submit with any billing request for such material. Required information includes, but is not limited to: a general description of the material; a detailed list of the materials; a pre-approved storage area; segregation and identification of the material; insurance covering full value against all risks of loss or damage, with non-cancellation provision; immediate replacement agreement in event of loss or damage; agreement to pay the expense of all inspections of the material; ownership provisions; delivery guarantee; project completion statement; bill of sale, releases of liens, and inventory. The Owner, in its sole and exclusive discretion, may require the Contractor to certify in the agreement for materials stored off-site that the materials comply with one or more requirements of the

Contract or to provide documentary proof acceptable to the Owner that the materials comply with one or more requirements of the Contract.

H. All monthly billing requests submitted by the Contractor shall only be in the form and manner approved by the Owner. The Contractor shall furnish such affidavits, vouchers, receipts, and other documentation as to delivery and payment for materials, payment of Subcontractors, and payment of prevailing rate of wage and supplements required by NYS Labor Law as the Owner requires to substantiate each and every billing request. Contractor shall furnish any other documentation required by Owner to establish compliance with one or more requirements of the Contract or any statute or regulation, including but not limited to the certification required by General Conditions Section 16.02 and proof of compliance with NYS Labor Law Section 220-h (See General Conditions Section 16.03 H).

I. All payments received by the Contractor under or in connection with the Contract are trust funds under Article 3-A of the NYS Lien Law and shall be applied by the Contractor in accordance with such law.

Section 8.02 - Substantial Completion and Reduction of Retainage

A. After the Owner has determined Substantial Completion of the Work, as evidenced by the executed Notice of Substantial Completion, the Owner shall pay to the Contractor the balance due the Contractor pursuant to the Contract less:

1. Two (2) times the value of any remaining items of Work to be completed or corrected as determined in accordance with paragraph B. of this General Conditions Section 8.02.

2. An amount necessary to satisfy any and all claims, liens, or judgments by the Owner or third parties against the Contractor.

B. After the Owner has determined Substantial Completion of the Work, as evidenced by the executed Notice of Substantial Completion, the Contractor shall submit to the Owner, for Owner's written approval, a detailed estimate of the value of the known remaining items of Work as set forth by the Owner and a schedule for achieving Physical Completion and Completion and Acceptance of the Work. The Owner shall review that estimate and schedule and:

1. Direct the Contractor to revise and resubmit the estimate, the schedule or both; or

2. Approve the estimate and schedule.

The Owner, at its discretion, may value the items of Work to be completed or corrected assuming such items will be completed or corrected by an entity other than the Contractor and may include the cost of obtaining regulatory or other third-party approval of one or more items of Work.

C. As the remaining items of Work are completed and accepted by the Owner, the Owner shall pay the appropriate amount pursuant to a duly completed and submitted Application for Payment.

D. The list of remaining Work items may be expanded to include additional items of corrective or completion Work until Completion and Acceptance by the Owner. Appropriate payments may be withheld to cover the value of these items pursuant to this General Conditions Section 8.02.

E. The Contractor may request from the Owner a reduction of retainage when a phase of the Work is accepted by the Owner but Owner is not obligated to grant such request.

F. The Application for Payment for the first payment of reduction of retainage shall be accompanied by:

1. A release by the Contractor to the Owner of all Claims by and all liability to the Contractor for all items in connection with the Work and for every act and neglect of the Owner and others relating to or arising out of the Work; or

2. A release by the Contractor to the Owner of all Claims by and all liability to the Contractor for all items in connection with the Work and for every act and neglect of the Owner and others relating to or arising out of the Work, excepting and reserving to the Contractor those Claims specified by the Contractor in the release. Owner's acceptance of a release containing Claims specified by and reserved to the Contractor does not waive any rights of the Owner arising under the Contract or any other source with respect to such Claims.

The requirement of a release may be waived only in writing and only by the Owner's Office of Counsel. No payment, final or otherwise, shall operate to release the Contractor or the Contractor's sureties from any obligations under this Contract or the Performance or Payment bonds.

Section 8.03 - Release and Consent of Surety

Notwithstanding any other provision of the Contract Documents to the contrary, reduction of retainage and/or the final Application for Payment shall not become due until the Contractor submits to the Owner a General Release from the Contractor and, if the Owner requests, a Consent of Surety to said payment in form and content acceptable to the Owner. No payment, final or otherwise, shall operate to release the Contractor or the Contractor's sureties from any obligations under this Contract or the Performance or Payment bonds.

Section 8.04 - Liens

A. Upon the Owner's receipt of a notice of public improvement lien, all, or a portion, of the amounts due in the current and subsequent payments due the Contractor shall be withheld until a sum which shall be one and one-half (1 1/2) times the amount stated to be due in the notice of public improvement lien shall have been withheld from payments due the Contractor. This sum shall be withheld until the lien is discharged. The Contractor shall promptly discharge any notice of public improvement lien by filing a bond pursuant to NYS Lien Law Section 21, subdivision 5. If any Subcontractor should file a notice of lien against the property upon which the Project is located, such lien is void and Contractor, at its expense shall obtain and file an order of the Supreme Court of the State of New York cancelling such lien. If Contractor shall fail to obtain such order or if Contractor shall file a notice of lien against the property upon which the Project is located, the Owner may obtain an order of the Supreme Court of the State of New York cancelling such lien and deduct the attorney's fees and other costs incurred in obtaining and filing such order from any amount due the Contractor.

B. Upon receipt of any other lien, levy, notice to withhold, restraining notice, court or administrative order or any other instrument allowed by law and directing the Owner to withhold payments due Contractor, the Owner will withhold the sum which Owner determines is necessary to withhold to comply with the applicable law. This sum shall be withheld until the instrument is, in the Owner's sole and exclusive discretion, appropriately satisfied or discharged.

Section 8.05 - Withholding of Payments

A. The Owner may withhold from the Contractor any part of any payment as may, in the judgment of the Owner, be necessary:

1. To ensure payment of just claims of any natural person or entity supplying labor, materials, or equipment for the Work.

2. To protect the Owner from loss due to defective Work not remedied.

3. To protect the Owner, Client, or any Consultant from loss due to failure to defend, loss due to injury to persons or damage to the Work or property of Other Contractors, Subcontractors or others caused by the act or neglect of the Contractor or Subcontractors.

4. To ensure payment of fines and penalties, that may be imposed on the Contractor pursuant to the provisions of the Contract.

5. To ensure payment of fines, penalties, or damages that may be imposed on the Contractor pursuant to General Conditions Article 20 - Opportunity Programs.

6. To protect and make whole the Owner from a Contractor's non-compliance to the requirements set forth in General Conditions Article 14 – Protection of Persons and Property and Article 15 – Insurance and Bonds.

7. To protect the Owner and Client from damage caused or claimed to have been caused directly or indirectly by the failure of the Contractor to perform the Work of the Contract in strict accordance with the Contract Documents.

B. The Owner shall have the right to apply any such amounts so withheld in such a manner as the Owner may deem proper to satisfy said claims, fines, and penalties, or to secure said protection. Said application of the money shall be deemed payments for the account of the Contractor.

Section 8.06 - Late Payment

Timeliness of payment and any interest to be paid to the Contractor for late payment is governed by Section 2880 of the NYS Public Authorities Law. Timely payment by the Contractor to the Subcontractor is governed by Section 139-f of the NYS State Finance Law which requires payment by the Contractor to the Subcontractor within seven (7) calendar days of receipt of payment from the Owner.

Section 8.07 – False Representations/Information

A. False Representations, information, or data submitted on or with Applications for Payment may result in one or more of the following actions:

1. Termination of the Contract for cause;

2. Disapproval of future bids or contracts or subcontracts;

3. Withholding of final payment on the Contract; and

4. Civil and/or criminal prosecution (See General Conditions Sections 7.01 E and 10.03 F).

B. The provisions of this General Conditions Section 8.07 are solely for the benefit of the Owner, and any action or non-action hereunder by the Owner shall not give rise to any liability on the part of the Owner.

ARTICLE 9 -- TIME OF COMPLETION

Section 9.01 - Substantial Completion

A. The Contractor shall commence performance of the Work at the time stated in the Notice to Proceed and the Contractor shall achieve Substantial Completion no later than the date for Substantial Completion specified in the Contract. Notwithstanding anything to the contrary, a schedule submitted by the Contractor showing Substantial Completion earlier than that specified in the Contract shall not entitle the Contractor to any additional cost in the event the earlier date is not realized.

B. It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that Substantial Completion of the Work on or before the date for Substantial Completion specified in the Contract, is an essential condition of the Contract.

C. The Contractor agrees that the Work shall be prosecuted regularly, diligently, and cooperatively with Other Contractors at such rate of progress as shall ensure Substantial Completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time to achieve Substantial Completion allowed herein is reasonable.

D. It is further agreed that time is of the essence for each and every portion of the Work. In any instance in which additional time is allowed for Substantial Completion of the Work, the new date of Substantial Completion established by said extension shall be of the essence. The Contractor shall not be charged with liquidated damages or any excess cost of the Owner or Client if the Owner determines in its sole and exclusive discretion that the Contractor is without fault and that the delay in Substantial Completion of the Work is due:

   1. To any preference, priority or allocation order duly issued by the Government of the United States or the State of New York.

   2. To an unforeseeable cause beyond the control and without the fault of, or negligence of the Contractor, and approved by the Owner, including, but not limited to, acts of God or of public enemy, acts of the Owner, fires, epidemics, quarantine, restrictions, strikes, freight embargoes and unusually severe weather.

   3. To any delays of Subcontractors or suppliers occasioned by any of the causes specified in Subsections 1 and 2 of this paragraph provided the Contractor shall, within fifteen (15) calendar days from the beginning of any such delay, notify the Owner in writing of the causes of the delay. Notice shall be delivered to the Owner as specified in General Conditions Section 10.03 C.

E. The date of Substantial Completion may be modified only by a Change Order.

F. If the Contractor shall neglect, fail, or refuse to achieve Substantial Completion by the date specified, or any proper extension thereof granted by the Owner, the Contractor agrees to pay to the Owner for loss of beneficial use of the Work of the Contract an amount specified in the Contract, not as a penalty, but as liquidated damages, for each and every calendar day thereafter that the Contractor does not achieve Substantial Completion.

G. If the Contractor shall abandon performance of the Work before achieving Substantial Completion, the Contractor agrees to pay to the Owner for loss of beneficial use of the Work of the Contract an amount specified in the Contract, not as a penalty, but as liquidated damages, for each and every calendar day

after both the date of abandonment and the date specified for Substantial Completion that the Work has not achieved Substantial Completion. The obligation of the Contractor to pay liquidated damages as provided in this paragraph shall survive the termination of the Contract pursuant to General Conditions Section 11.01.

H. If the Owner terminates the Contract before the Contractor achieves Substantial Completion, the Contractor agrees to pay to the Owner for loss of beneficial use of the Work of the Contract an amount specified in the Contract, not as a penalty, but as liquidated damages, for each and every calendar day after both the date of termination of the Contract and the date specified for Substantial Completion that the Work has not achieved Substantial Completion. The obligation of the Contractor to pay liquidated damages as provided in this paragraph shall survive the termination of the Contract pursuant to General Conditions Section 11.01.

I. Said amount of liquidated damages is agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages which the Owner would sustain for loss of beneficial use of the Work of the Contract in the event of delay in Substantial Completion, abandonment of the Work by the Contractor or termination of the Contract pursuant to General Conditions Section 11.01, and said amount is agreed to be the amount of damages sustained by the Owner and said amount may be retained from time to time by the Owner.

J. The foregoing liquidated damages are intended to compensate the Owner only for the loss of beneficial use of the Work of the Contract. In addition, the Contractor shall be liable to the Owner and the Client, to the fullest extent permitted by law, for whatever actual damages (other than actual loss of beneficial use) the Owner or Client may incur as a result of any actions or inactions of the Contractor or its Subcontractors including, without limitation, interest expense and carrying costs, liabilities to Other Contractors working on the Project or other third parties, job extension costs, and other losses incurred by the Owner or Client. The provisions of this paragraph are for the exclusive use of the Owner and Client, and shall not accrue to Other Contractors or other third parties.

K. The Owner will issue the Notice of Substantial Completion after the Owner, in its sole and exclusive discretion, has determined that Substantial Completion of the Work has occurred.

Section 9.02 – Physical Completion and Completion and Acceptance

A. After the Owner has issued the Notice of Substantial Completion, the Contractor shall comply with General Conditions Section 8.02 B. Compliance with General Conditions Section 8.02 B is a condition precedent to the payment described in General Conditions Section 8.02 A. Once the Owner approves the detailed estimate of the value of the known remaining items of Work and the schedule for achieving Physical Completion and Completion and Acceptance, the Contractor shall achieve Physical Completion and Completion and Acceptance no later than the dates for each in the approved schedule. The Owner and Contractor agree that achieving Physical Completion and Completion and Acceptance no later than the dates for each in the approved schedule is an essential condition of the Contract and that time is of the essence.

B. The Contractor agrees that after achieving Substantial Completion, Contractor shall continue to prosecute the remaining items of Work regularly, diligently, and cooperatively with Other Contractors. Contractor further agrees that once the schedule for achieving Physical Completion and Completion and Acceptance is approved, the Contractor shall prosecute the remaining items of Work regularly, diligently, and cooperatively with Other Contractors at such a rate of progress as shall ensure the achieving of Physical Completion and Completion and Acceptance by the dates for each in the approved schedule.

C. The list of remaining Work items may be expanded to include additional items of corrective or completion Work until Completion and Acceptance by the Owner. Appropriate payments may be withheld to cover the value of these items pursuant to General Conditions Section 8.02.

D. The Owner will issue the Notice of Physical Completion after the Owner, in its sole and exclusive discretion, has determined that Physical Completion of the Work has occurred.

E. The Owner will issue the Notice of Completion and Acceptance after the Owner, in its sole and exclusive discretion, has determined that Completion and Acceptance of the Work has occurred. Completion and Acceptance follows or may be concurrent with Physical Completion.

ARTICLE 10 -- CLAIMS AND DISPUTES

Section 10.01 - Claim for Extra Work

A. If the Contractor claims that:

1. a decision of, or direction or response to the Contractor by, the Owner, Consultant, or Owner Representative;

2. a condition; or

3. any action or omission of the Owner

is contrary to the terms and provisions of the Contract and will require the Contractor to perform Extra Work, Contractor shall file a written notice of Claim in strict accordance with General Conditions Section 10.03. No Claim for Extra Work shall be allowed unless the Contractor files a written notice of Claim that complies strictly with the requirements of General Conditions Sections 10.01 and 10.03. The notice of Claim shall identify the decision, direction, response, action, omission, or condition from which the Claim arises. The Contractor shall also strictly comply with all other requirements of General Conditions Sections 10.01 and 10.03.

B. If the Owner determines the decision, response, direction, action, omission, or condition does not require the performance of Extra Work, the Owner shall issue a Disputed Work Directive. The Contractor, upon receipt of the Disputed Work Directive shall immediately and diligently proceed with the Work described in the Disputed Work Directive in accordance with all instructions of the Owner. Contractor's failure to proceed immediately and diligently with any Disputed Work Directive issued by the Owner, unless the Owner in writing directs otherwise, shall be a material breach of the Contract. Contractor's performance of the Work described in and pursuant to the Disputed Work Directive shall not be a waiver of the Contractor's Claim for Extra Work provided the Contractor strictly complies with all requirements of General Conditions Sections 10.01 and 10.03. The Owner may issue a Disputed Work Directive for a decision, response, direction, action, omission, or condition before the Contractor files a notice of Claim arising from such decision, response, direction, action, omission, or condition; if the Owner does so, the Contractor shall still file a notice of Claim in strict compliance with General Conditions Section 10.03 and shall strictly comply with all requirements of General Conditions Sections 10.01 and 10.03.

C. The Contractor's failure to comply strictly with any or all parts of General Conditions Sections 10.01 and 10.03 shall be deemed to be:

1. a conclusive and binding determination on the part of the Contractor that the decision, response, direction, action, omission, or condition does not involve Extra Work; and

2. a waiver by the Contractor of all Claims for additional compensation or damages as a result of the decision, response, direction, action, omission, or condition.

Section 10.02 - Claim for Additional Cost

A. If the Contractor wishes to make a Claim for an increase in the cost to perform the Work, including but not limited to a Claim alleging breach of the Contract by Owner, the Contractor shall file a written notice of Claim strictly in accordance with General Conditions Section 10.03. The notice of Claim shall identify the condition or event from which the Claim arises. No Claim for an increase in the cost to perform the Work of the Contract shall be allowed unless the Contractor files a notice of Claim that complies strictly with the requirements of General Conditions Section 10.02 and 10.03. Contractor shall also strictly comply with all other requirements of General Conditions Sections 10.02 and 10.03. The Owner shall determine the validity of the Contractor's contention. Pending the decision of the Owner, the Contractor shall proceed with the diligent and prompt performance of the Work. Denial of additional costs shall not entitle the Contractor to additional time to achieve Substantial Completion. Nothing in this paragraph waives any of Owner's rights under the Contract.

B. The Contractor's failure to comply strictly with any or all parts of General Conditions Sections 10.02 and 10.03 shall be deemed to be:

1. a conclusive and binding determination on the part of the Contractor that the event or condition does not increase the cost to perform the Work of the Contract; and

2. a waiver by the Contractor of all Claims for additional compensation or damages as a result of the event or condition.

Section 10.03 - Notice of Claim and Substantiation

A. A written notice of Claim shall be delivered concurrently to the Owner's Representative and Project Controls Unit by the Contractor within fifteen (15) calendar days after occurrence of the event, decision, direction, response, action, or omission giving rise to such Claim or within fifteen (15) calendar days after the Contractor first recognizes the condition giving rise to the Claim, whichever is earlier. The burden of proving the Owner's receipt of the notice of Claim shall be the Contractor's responsibility.

B. Within ninety (90) calendar days of the initial notice of Claim, the Contractor shall substantiate the Claim in writing and document the nature of the Claim and provide supporting cost data and documentation, Contractor's original cost estimate, Project CPM schedule demonstrating alleged impact of and correlation to the Claim subject matter and a Contractor affidavit stating the following:

"I hereby certify that the value assigned the work, labor, material and equipment that comprise the Claim, represents the actual value of said work, labor, material and equipment pursuant to the Contract between the undersigned and the Dormitory Authority."

1. The Contractor shall provide, every thirty (30) calendar days thereafter for as long as such damages are incurred, written, verified statements of the details and the amounts of such damages, together with documentary evidence of such damages.

2. Contractor shall identify the final written, verified statement for each Claim submitted pursuant to this paragraph.

3. Each written, verified statement shall be delivered as set forth in paragraph C of this General Conditions Section 10.03.

C. The Contractor shall provide the Owner's Representative one (1) paper copy of the documented Claim and mail two (2) paper copies of the documented Claim to:

Dormitory Authority
Project Controls Unit
515 Broadway
Albany, NY 12207-2964

D. The Owner, at any time after the Contractor files a notice of Claim, may request additional documentation to determine the validity of the Contractor's contention and the Contractor shall submit such additional documentation within the time period specified by the Owner in the Owner's request for additional documentation. The Owner, at any time after the Contractor files a notice of Claim, may request an electronic copy of the documented Claim and the Contractor shall submit such a copy within ten calendar days.

E. The value of any Claim, if allowed, shall be determined by the methods described in General Conditions Article 7 – Changes in the Work. No Claim shall be allowed unless and until a Change Order allowing the Claim is executed and delivered by the Owner to the Contractor; payment of an allowed Claim may be made only through an Application for Payment.

F. Any information representing the actual value of the labor performed, equipment utilized and material Furnished contained in the Claim that constitutes False Representation may subject the Contractor or Subcontractor to criminal charges, including NYS Penal Law Sections 175.35 (Offering a False Instrument for Filing) and 210.40 (False Statement) and/or Title 18 U.S.C. Sections 1001 (Fraudulent and False Statements) and/or termination of the Contract for cause and civil prosecution under Article XIII of the NYS State Finance Law – the New York False Claims Act.

Section 10.04 - No Damages for Delay

A. No Claims for increased costs, charges, expenses, or damages of any kind shall be made by the Contractor against the Owner for any delays or hindrances from any cause whatsoever; provided that the Owner, in the Owner's sole and exclusive discretion, may compensate the Contractor for any said delays or hindrances by extending the date for achieving Substantial Completion specified in the Contract. No payment for increased cost, charge, expense, or damage of any kind shall act as a waiver of the Owner's right, in its sole and exclusive discretion, to compensate the Contractor for any delays or hindrances from any cause whatsoever solely by extending the date for achieving Substantial Completion specified in the Contract.

B. If the Contractor claims that a delay or hindrance entitles the Contractor to additional time to achieve Substantial Completion, the Contractor shall submit a written request to the Owner for such additional time within fifteen (15) calendar days of the event or condition giving rise to the request. The written request shall identify the event or condition causing the alleged delay or hindrance giving rise to the request and show that the Contractor is not responsible for the delay or hindrance or for any concurrent delay. The Contractor shall submit with the request an updated Project CPM schedule that shows the impact of the event or condition on the Project CPM schedule. The request and updated Project CPM

schedule shall be submitted to the Owner in accordance with General Conditions Section 10.03 C. The Owner may request additional documentation to decide the Contractor's request and the Contractor shall submit such additional documentation within the time period specified by Owner in the Owner's request for additional documentation. Failure of the Owner to respond in writing to a written request for additional time within thirty (30) calendar days shall be deemed a denial of the request unless the Owner extends the period to respond to the written request for additional time by written notice to the Contractor. While the Owner is considering the Contractor's request, the Contractor shall proceed with the diligent and prompt performance of the Work. Denial of additional time shall not entitle the Contractor to additional costs.

C. The Contractor's failure to comply strictly with any or all parts of General Conditions Sections 10.03 and 10.04 shall be deemed to be:

1. a conclusive and binding determination on the part of the Contractor that the event or condition causing the alleged delay or hindrance does not require additional time to achieve Substantial Completion; and

2. a waiver by the Contractor of all Claims for additional time to achieve Substantial Completion as a result of the event or condition causing alleged delay or hindrance.

Section 10.05 - Continuance of the Work

Unless the Owner, in writing, permits otherwise, the Contractor shall proceed diligently and promptly with the performance of the Work while the Owner considers a notice of Claim filed pursuant to:

A. General Conditions Sections 7.01D and 10.03;

B. General Conditions Sections 10.01 and 10.03; or

C. General Conditions Sections 10.02 and 10.03;

or while the Owner considers a request for additional time to achieve Substantial Completion filed pursuant to General Conditions Sections 10.03 and 10.04 or while the Owner considers any other Claim.

Section 10.06 - Resolution of Claim

A. Any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion shall be final, binding and conclusive on the Contractor unless within fifteen (15) calendar days after receiving notice of the Owner's resolution, the Contractor files a written notice with the Owner that the Contractor reserves the Contractor's rights under the Contract in connection with the matters covered by said resolution or determination. The written notice shall be filed in strict accordance with General Conditions Sections 10.03 C and 10.06. The Contractor's failure to comply strictly with these requirements shall be deemed to be a waiver by the Contractor of all Claims for additional compensation or damages included in the Claim and the request for additional time to achieve Substantial Completion.

B. After any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion, the Contractor shall proceed diligently and promptly with the performance of the Work whether the Contractor files a written notice with the Owner that the Contractor reserves the Contractor's rights under the Contract in connection with the matters covered

by said resolution or determination or the Contractor does not file such a written notice. Nothing in this paragraph waives any of the Owner's rights under the Contract.

C. Contractor shall file no action or proceeding in a court challenging any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion unless the Contractor shall have strictly complied with all the requirements relating to the giving of notice and of information with respect to such Claim or request for additional time to achieve Substantial Completion in this General Conditions Article 10. Nothing in this paragraph waives any of Owner's rights under the Contract.

D. Contractor shall file no action or proceeding in court challenging any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion until Contractor has achieved Physical Completion of the Work. Contractor agrees that any court action or proceeding challenging any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion filed before Contractor has achieved Physical Completion of the Work is premature. Nothing in this paragraph waives any of Owner's rights under the Contract. The Owner, in its sole and exclusive discretion, may modify this paragraph by a Contract Amendment.

E. At its sole and exclusive discretion, the Owner may resolve any Claim or a request for additional time to achieve Substantial Completion without waiving its rights under the Contract.

ARTICLE 11 – TERMINATION OR SUSPENSION

Section 11.01 – Termination for Cause

A. In the event that any provision of the Contract is violated by the Contractor or by any Subcontractor, the Owner may serve written notice upon the Contractor and upon the Contractor's surety, if any, of the Owner's intention to declare a Contractor Default (defined in the Performance Bond) and terminate the Contract. Such notice shall contain the reasons for the intention to declare a Contractor Default and terminate the Contract. The Contractor will be allowed an opportunity to show why the Owner should not declare a Contractor Default and why the Contractor's Contract should not be terminated for cause. If the violation shall not cease or arrangements satisfactory to the Owner are not made, the Owner, in writing, may declare a Contractor Default and the Contract shall terminate upon the date specified by the Owner in the declaration of Contractor Default. The Owner shall send the Contractor and the Contractor's surety, if any, written notice of and a copy of the declaration of Contractor Default and termination of the Contract. In the event of a declaration of Contractor Default and termination of the Contract, the Owner has the remedies set forth in the Performance Bond, the Contract, and all remedies at law or in equity.

B. In the event of any such termination, the Owner may take over the Work and prosecute the Contract to completion and take possession of and may utilize such materials, appliances, and equipment on the Site and necessary or useful in completing the Work. The Contractor and Contractor's surety shall be liable to the Owner for all costs incurred by the Owner.

C. In the event the termination for cause is determined to be improper, the termination shall be deemed a termination pursuant to General Conditions Section 11.02 – Termination for Convenience of Owner.

Section 11.02 - Termination for Convenience of Owner

A. The Owner, at any time, may terminate the Contract in whole or in part. Any such termination shall be effected by delivering to the Contractor a written notice of termination specifying the extent to which

performance of Work under the Contract is terminated and the date upon which the termination becomes effective. Upon receipt of the notice of termination, the Contractor shall act promptly to minimize the expenses resulting from the termination.

B. The Owner shall pay the Contractor for Work of the Contract performed by the Contractor and accepted by the Owner for the period extending from the end of the period covered by the last approved Application for Payment up to the effective date of the termination, an amount determined in accordance with General Conditions Article 7 – Changes in the Work. In no event shall the Contractor be entitled to compensation in excess of the total consideration of the Contract. In no event shall Contractor be entitled to overhead or profit on the Work not performed.

C. In the event of such termination the Owner may take over the Work and prosecute the Contract to completion and may take possession of and may utilize such materials, appliances, and equipment on the Site and necessary or useful in completing the Work.

Section 11.03 - Owner's Right to do Work

The Owner at any time may notify the Contractor that the Owner will have the Work of the Contract or any part thereof, performed by others, without terminating the Contract and without prejudice to any other right the Owner may have. The Owner may recover any and all costs related to such Work and deduct the value of such Work from the Contract amount.

Section 11.04 - Suspension of Work

A. The Owner may order the Contractor in writing to suspend, delay or interrupt performance of all or any part of the Work for a reasonable period of time as the Owner may determine. The order shall contain the reason or reasons for issuance which may include, but is not limited to, latent field conditions, substantial program revisions, acquisition of rights of way or real property, financial crisis, labor disputes, civil unrest, expired insurance, court order or acts of God.

B. Upon receipt of a suspension order, the Contractor shall, as soon as practicable, cease performance of the Work as ordered and take immediate affirmative measures to protect such Work from loss or damage.

C. The Contractor specifically agrees that such suspension, interruption, or delay of the performance of the Work shall not increase the cost of performance of the Work. However, to the extent that the suspension of the Work is through no fault of the Contractor, the Owner may consider requests for compensation provided that the justification is submitted in accordance with General Conditions Article 10 – Claims and Disputes.

D. The date of Substantial Completion of the Work may be extended by Change Order to compensate the Contractor for the time lost by the suspension, interruption, or delay.

E. The Owner may terminate the suspension, interruption, or delay of the performance of the Work by a written direction to the Contractor or may invoke any other provision of General Conditions Article 11 – Termination or Suspension.

Section 11.05 - Stop Work

A. Should the Contractor fail to comply with the terms of the Contract, including but not limited to the insurance requirements of the Contract, the Owner, at any time, by written order to the Contractor, can

require the Contractor to stop all, or any part, of the Work called for by the Contract. The order shall be specifically identified as a Stop Work Order. Upon receipt of the order, the Contractor shall immediately comply with its terms and take reasonable steps to protect the Work covered by the order during the period of work stoppage. The Owner, at its option shall either:

1. Cancel the Stop Work Order after the Contractor has successfully remedied the cause of the Stop Work Order.

2. Invoke any other provision of General Conditions Article 11 – Termination or Suspension.

B. The Contractor shall not be entitled to an increase in time or costs as a result of the Stop Work Order.

ARTICLE 12 -- BENEFICIAL OCCUPANCY

Section 12.01 - Occupancy Prior to Substantial Completion

A. If, before Substantial Completion, the Owner desires Beneficial Occupancy of any part of the Work, the Owner shall have the right to do so, and the Contractor shall in no way interfere with or object to Beneficial Occupancy. Payment for operational costs of Project systems for the part of the Work subject to Beneficial Occupancy from the time of Beneficial Occupancy to Substantial Completion shall be borne by the Owner, unless otherwise specified by the Contract.

B. Said Beneficial Occupancy (1) shall not constitute acceptance of space, systems, materials, or elements of the Work and (2) shall not affect the obligations of the Contractor for Work which is not in accordance with the requirements of the Contract or other obligations of the Contractor under the Contract.

The Contractor shall continue the performance of the Work in a manner that shall not unreasonably interfere with said use, occupancy, and operation by the Owner.

ARTICLE 13 -- INSPECTION AND ACCEPTANCE

Section 13.01 - Access to the Work

The Owner shall at all times have access to the Work and the Contractor shall provide proper facilities for access. If the Contractor schedules or performs any Work on a day or at a time which results in a Dormitory Authority employee assigned to the Project receiving overtime compensation or an additional charge to the Dormitory Authority from an Other Contractor for such Work, the Dormitory Authority, in its sole and exclusive discretion, may deduct such overtime compensation and such additional charge from moneys due the Contractor. If the Contractor intends to schedule any Work, including but not limited to any testing or inspection, outside the regular operating hours for the Project, the Contractor must provide the Owner and any Other Contractor involved in such Work at least fifteen (15) calendar days written notice of the scheduled date for such Work. The Owner, in its sole and exclusive discretion, may reduce the required number of days of notice for one or more occasions by written notice to the Contractor and to any involved Other Contractors.

Section 13.02 - Notice for Testing and Inspection

If the Contract Documents, the Owner's instructions, laws, rules, ordinances, or regulations require that any Work be inspected or tested, the Contractor shall give the Owner a minimum of five (5) calendar days,

unless otherwise specified, written notice of readiness of the Work for inspection or testing and the date fixed for said inspection or testing.

Section 13.03 - Reexamination of Work

Reexamination of any part of the Work may be ordered by the Owner, and if so ordered the Work shall be uncovered by the Contractor. If said Work is found to be in accordance with the Contract, the Owner shall pay the cost of reexamination. If said Work is not found to be in accordance with the Contract, the Contractor shall pay the cost of reexamination and replacement.

Section 13.04 - Inspection of Work

All Work, all materials whether incorporated in the Work or not incorporated in the Work, all processes of manufacture, and all methods of construction shall be, at all times and places, subject to the inspection of the Owner, and the Owner shall be the final judge of the quality and suitability of the Work, materials, processes of manufacture, and methods of construction for the purposes for which said Work, materials, processes of manufacture, and methods of construction are used. Any Work not approved by the Owner shall be reconstructed, made good, replaced, or corrected immediately by the Contractor including all work of Other Contractors destroyed or damaged by said removal or replacement. Rejected material shall be removed immediately from the Site. Acceptance of material and workmanship by the Owner shall not relieve the Contractor from the Contractor's obligation to replace all Work that is not in full compliance with the Contract.

Section 13.05 - Defective or Damaged Work

If, in the opinion of the Owner, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the Work damaged or not performed in accordance with the Contract Documents, the Contract amount shall be reduced by an amount, which in the judgment of the Owner, shall be deemed equitable.

Section 13.06 – Testing of Work

All materials and equipment used in the Work shall be subject to testing in accordance with accepted standards to establish conformance with the Contract Documents and suitability for intended use or as directed by the Owner. Any Work covered or concealed without the approval or consent of the Owner, shall be uncovered for examination. No testing by the Owner or by a testing laboratory on behalf of the Owner relieves the Contractor of the responsibility to maintain quality control of materials, equipment, and installation to conform to the requirements of the Contract Documents. The Owner may order additional testing for any test results below specified minimums, above specified maximums or otherwise unacceptable. Additional cost for testing, professional services and any other expenses related to the additional testing shall be at the Contractor's expense. The Owner may deduct such costs from moneys due the Contractor.

Section 13.07 - Final Completion

No previous inspection shall relieve the Contractor of the obligation to perform the Work in accordance with the Contract. No payment, either partial or full, by the Owner to the Contractor shall excuse any failure by the Contractor to comply fully with the Contract Documents. The Contractor shall remedy all defects and deficiencies at the Contractor’s expense, paying the cost of any damage to other Work, the work of Other Contractors and the property of the Owner or Client. No Work is completed and accepted until

the Owner issues the Notice of Completion and Acceptance. Completion and Acceptance is limited to the Work described in the Notice of Completion and Acceptance.

Section 13.08 - Guarantee

The Contractor shall, in all respects, guarantee the Work to the Owner and be responsible for all material, equipment, and workmanship of the Work. The Contractor shall forthwith repair, replace or remedy in a manner approved by the Owner, at the Contractor's expense, any material, equipment, workmanship, or other part of the Work found by the Owner to be defective or otherwise faulty and not in compliance with the Contract Documents, which defect or fault appears during the minimum period of one (1) year, or such longer period as may be prescribed by the Contract, from the date of Substantial Completion determined by the Owner. For items of Work performed after the date of Substantial Completion, the minimum period of one (1) year in the preceding sentence shall begin with the date of Physical Completion. The Contractor shall also pay for any damage to the Work, any damage to the work of Other Contractors and any damage to the property of the Owner or Client resulting from said defect or fault.

ARTICLE 14 -- PROTECTION OF PERSONS AND PROPERTY

Section 14.01 – Site Safety and Protection

A. The Contractor and each Subcontractor shall comply with all applicable rules, regulations, codes, and bulletins of the New York State Department of Labor and to the standards imposed under the Federal Occupational Safety and Health Act of 1970, as amended. The Contractor and each Subcontractor shall comply with all Client safety requirements. The Contractor and each Subcontractor shall comply with all City of New York safety requirements for Projects within the City of New York constructed in accordance with the Building Code of the City of New York.

B. The Contractor and each Subcontractor, and only the Contractor and each Subcontractor, shall be responsible for the initiation, maintenance and supervision of safety precautions and programs in connection with the Work and the Contractor shall require each Subcontractor to initiate, maintain and supervise its own safety precautions and programs for any portion of the Work for which the Subcontractor is responsible and to generate safety reports for days when safety inspections occur. The Contractor shall prepare and submit to the Owner a written safety plan for the Site showing how all safety requirements of applicable law and the Contract will be implemented for the duration of the Contract. The Contractor shall designate a responsible person at the Site whose duties shall include maintaining site safety pursuant to OSHA and any other applicable requirement, conducting weekly tool box meetings with its workers, implementing the Site safety plan and providing the Owner with a copy of such meeting minutes.

C. The Owner shall provide the Contractor with copies of the Owner's safety orientation booklet. The Contractor shall provide a copy to each of its workers and to each worker of its Subcontractors prior to each worker starting Work. The Contractor shall maintain documentation that each worker received a copy of the Owner's safety orientation booklet prior to the worker starting Work.

D. The Contractor and each Subcontractor shall, at all times: (1) guard the Owner's property from damage or loss in connection with the Work; (2) guard and protect the Contractor's Work and adjacent property; (3) replace or make good any said loss or damage unless said loss or damage is caused directly by the Owner; and (4) guard the lives and health of all persons on and in the vicinity of the Site.

E. The Contractor and each Subcontractor shall protect all adjoining property and shall repair or replace any said property damaged or destroyed during the progress of the Work.

F. The Contractor is responsible for ensuring that each Subcontractor executes the Subcontractor's obligations in this General Conditions Section 14.01.

Section 14.02 - Protection of Work

A. The Contractor shall be responsible for the safety, efficiency and adequacy of the Contractor's Work, plant, appliances, and methods, and for any damage which may result from the failure or the improper construction, maintenance, or operation of such Work, plant, appliances, and methods.

B. The Contractor shall have full responsibility to protect and maintain all materials on and off site in proper condition and forthwith repair, replace and make good any damage thereto until Physical Completion. The Contractor shall maintain an inventory of all materials for the Project that are delivered to the Site or approved for off-site storage facilities pursuant to General Conditions Section 8.01 G. All tools, spare parts, extra materials, attic stock and similar items delivered by the Contractor after Physical Completion shall be in proper condition and Contractor shall forthwith repair, replace, and make good any damage thereto until the later of Completion and Acceptance or the expiration of one year from delivery.

C. The Contractor shall immediately report any loss, theft, burglary, vandalism, or damage of materials or installed work to the Owner by phone and email as soon as it is discovered. If vandalism, theft, or burglary is suspected as the cause of the loss, the Contractor shall notify Site security personnel and the municipal police, protect the place of the loss until released from protection by the Owner, and insure that no potential evidence relating to the loss is removed from the place of the loss.

D. Any insurance claim alleging damage to the Work shall be submitted to the Owner pursuant to General Conditions Section 10.03.

E. A claim for damage to the Work shall include the following in addition to the requirements of General Conditions Section 10.03:

1. A copy of a police report (if applicable).

2. A complete inventory of damages or lost items including:

    a. Description of each item.

    b. Purchase date and proof of delivery of each item.

    c. Supplier from whom purchased.

    d. Serial number (if applicable).

    e. Price of each item.

3. The name, address and telephone number of the person who controlled the lost or damaged items immediately before the loss or damage.

4. The name, address and telephone number of the person who discovered the loss or damage.

5. A written description of how the loss or damage occurred.

F. The Owner may deny any claim from the Contractor under this General Conditions Section 14.02 if all items required by this General Conditions Section 14.02 are not provided or are not satisfactory to the Owner.

Section 14.03 - Protection of Lives and Health

A. The Contractor and each Subcontractor shall be responsible for the safe performance of the Work and their Means and Methods of Construction and for any injury or loss that shall occur from a failure to meet such responsibility.

B. The Contractor shall, within twenty-four (24) hours, notify the Owner and each Subcontractor shall, within twenty-four (24) hours, notify the Contractor of any incident, accident, illness, or injury that occurred on the Project Site. The Contractor shall follow-up and provide the Owner with a copy of Form C-2, Employers Report of Injury/Illness within twenty-four (24) hours of any incident, accident, illness, or injury, a copy of the recorded OSHA Log and any and all reports and statements pertaining to such incident, accident, illness, or injury.

C. The Contractor and each Subcontractor shall maintain a record of all cases of death, illness or injury requiring medical attention, hospitalization, or causing loss of time from work, arising out of and in the course of performance of Work of the Contract.

D. The Contractor and each Subcontractor shall preserve and safeguard the area of any incident, accident, illness, or injury where the person required emergency medical treatment. The Contractor shall secure the area and not allow any material object or property to be altered, changed, moved, or removed from the area and post a person at the area to protect it. Safeguarding and protecting the area shall only be abandoned by the Contractor upon release by the Owner. The Contractor shall provide the Owner, within twenty-four (24) hours, a list of witnesses which includes the full name, home address, occupation and telephone number of each person and all maintenance records, tool box meeting records and daily reports reflecting the work performed on the day of the incident. The Contractor shall provide, within twenty-four (24) hours of learning of the actual or potential existence of any other witnesses, the Owner with updated information which includes the full name, home address, occupation, and telephone number of each additional witness.

E. If, in the performance of the Work, a harmful hazard is created for which appliances or methods of elimination have been approved by regulatory authorities, the Contractor shall install, maintain, and operate said appliances or methods.

F. The Contractor and each Subcontractor shall provide, within five (5) calendar days, written notice to each of its liability insurers (primary, excess and umbrella) of any such incident, accident, illness, injury, or death on the Project Site on behalf of itself, the Owner, the Client, and the Construction Manager. The Contractor and each Subcontractor shall provide to the Owner, the Client and the Construction Manager, a copy of such notice at the time such notice is given to each insurer as well as confirmation of receipt of such notice by each insurer.

G. The Contractor is responsible for ensuring that each Subcontractor executes the Subcontractor's obligations in this General Conditions Section 14.03.

H. Failure of the Contractor to comply with provisions of this General Conditions Section 14.03 shall be deemed a material breach of Contract and the Owner may impose a payment penalty on the Contractor for any act of non-compliance. The payment penalty shall not exceed one twentieth (1/20) of the

contract price or a maximum of One Thousand Dollars ($1,000) for each time the Contractor fails to perform or to provide the information, reports, forms, etc. required in this General Conditions Section 14.03. This payment penalty is not exclusive; the Owner may avail itself of any other contractual remedy available.

Section 14.04 - Risks Assumed by the Contractor

The Contractor agrees that each duty set forth in this General Conditions Section 14.04 is separate, distinct, and independent from the other duties in this General Conditions Section 14.04.

A. To the fullest extent permitted by law, the Contractor solely assumes the following distinct and several risks whether said risks arise from acts or omissions, whether supervisory or otherwise, of the Owner, of the Client, of any Subcontractor, of third persons or from any other cause, including unforeseen obstacles and difficulties which may be encountered in the performance of the Work, whether said risks are within or beyond the control of the Contractor and whether said risks involve any legal duty, primary or otherwise, imposed upon the Owner or Client, regardless of the presence or absence of culpable conduct on the part of the Contractor, excepting only risks which arise from faulty designs as shown by the Drawings and Specifications or from the percentage of negligence attributed to the Owner, the Client or the Construction Manager or the Owner's, Client's or Construction Manager's members, officers, representatives or employees that caused the loss, damage or injuries hereinafter set forth:

1. To the fullest extent permitted by law, the risk of loss or damage, including direct or indirect damage or loss, of whatever nature to the Work or to any plant, equipment, tools, materials or property furnished, used, installed or received by the Owner, the Construction Manager, the Contractor or any Subcontractor, materialman or worker performing services or furnishing materials for the Work regardless of the presence or absence of any culpable conduct on the part of the Contractor, excepting only risks which arise from the percentage of negligence attributed to the Owner, Client or Construction Manager or the Owner's, Client's or Construction Manager's members, officers, representatives or employees that caused the loss or damage. The Contractor shall bear said risk of loss or damage until Physical Completion or until completion or removal of said plant, equipment, tools, materials or property from the Site and the vicinity thereof, whichever event occurs last. In the event of said loss or damage, the Contractor immediately shall repair, replace, or make good any said loss or damage.

2. To the fullest extent permitted by law, the risk of claims, just or unjust, by third persons against the Contractor, the Owner, the Client, or the Construction Manager on account of wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising out of or alleged to arise out of or as a result of or in connection with the performance of the Work by the Contractor or any Subcontractor, whether actually caused by or resulting from the performance of the Work, or out of or in connection with the operations of the Contractor or any Subcontractor or presence at or in the vicinity of the Site of the Contractor or any Subcontractor, regardless of the presence or absence of any culpable conduct on the part of the Contractor. The Contractor shall bear the risk for all deaths, injuries, damages or losses sustained or alleged to have been sustained prior to Physical Completion of the Work excepting only the percentage of negligence attributed to the Owner, Client or Construction Manager or the Owner's, Client's or Construction Manager's members, officers, representatives or employees that caused the deaths, losses, damages or injuries, regardless of the presence or absence of any culpable conduct on the part of the Contractor. The Contractor shall bear the risk for all deaths, injuries, damages, or losses sustained or alleged to have been sustained after Physical Completion resulting from the Contractor's negligence or alleged negligence.

3. To the fullest extent permitted by law, the Contractor assumes entire responsibility and liability for any and all damage or injury of any kind or nature whatsoever, including death resulting therefrom, to all persons, whether employees of the Contractor or otherwise, and to all property, arising out of or alleged to arise out of or as a result of or in connection with the performance of the Work by the Contractor or any Subcontractor, whether actually caused by or resulting from the performance of the Work, or out of or in connection with the Contractor's or any Subcontractor's operations or presence at or in the vicinity of the Site, regardless of the presence or absence of any culpable conduct on the part of the Contractor. If any person shall make said claim for any damage or injury, including death resulting therefrom, or any alleged breach of any statutory duty or obligation on the part of the Owner, the Client, Construction Manager, or any of the servants and employees of the Owner, Client or Construction Manager, the Contractor shall indemnify and hold harmless the Owner, the Client, the Construction Manager, and any of such servants and employees, for any and all loss, damage or injury that the Owner, the Client Construction Manager, or any such servants and employees, may sustain as the result of any claim, provided however, the Contractor shall not be obligated to indemnify and hold harmless the Owner, the Client Construction Manager, and any such servants and employees for their own negligence, if any. In the event that any negligence is attributed to the Owner, Client, Construction Manager or any such servants or employees, then that particular entity or person shall be indemnified and held harmless for all of its liability minus the percentage of negligence attributed to that particular entity or person.

4. Notwithstanding any contrary provision of the Contract, and to the fullest extent permitted by law, the Contractor shall, within ten (10) calendar days of notice from the Owner, Client or Construction Manager, assume the obligation to defend and represent the Owner, the Client, the Construction Manager, and any of the servants and employees of the Owner, Client or Construction Manager, with counsel selected by the Owner, in all claims by third parties arising out of or alleged to arise out of or as a result of or in any way associated with the duties, obligations or requirements of the Contractor or any Subcontractor pursuant to the Contract, or the presence of the Contractor or any Subcontractor on the Site. This obligation to defend applies immediately and is separate and independent of and distinct from the enforceability of any obligation of Contractor or any Subcontractor to indemnify or hold harmless the Owner, the Client, the Construction Manager and the servants or employees of the Owner, Client, and Construction Manager. The Contractor's obligation to defend includes, but is not limited to, payment of any legal fees associated with defending the Owner, the Client, the Construction Manager and any such servants and employees, all costs of investigation, expert evaluation, and any other costs. If the Contractor fails to so defend and represent the Owner, the Client, the Construction Manager, or any such servants and employees with counsel selected by the Owner, the Owner may proceed to defend and represent itself, the Client, the Construction Manager and any such servant and employee with counsel selected by Owner. Contractor shall make payment of the selected counsel's fees and expenses and all other defense costs incurred by Owner immediately upon receipt of Owner's demand.

B. The Contractor's obligations under this General Conditions Article shall not be deemed waived, limited or discharged by the enumeration or procurement of any insurance for liability for damages. The Contractor shall notify its insurance carrier within twenty-four (24) hours after receiving a written notice of loss or damage or claim from the Owner, the Client, or the Construction Manager. The Contractor shall make a claim to its insurer specifically under the provisions of the contractual liability coverage and any other coverage afforded the Owner, the Client or Construction Manager including those of being a named insured or an additional insured where applicable.

C. Neither Completion and Acceptance of the Work nor making any payment shall release the Contractor from the Contractor's obligations under this General Conditions Article. The enumeration elsewhere in the Contract of particular risks assumed by the Contractor or of particular claims for which the

Contractor is responsible shall not be deemed to limit the effect of the provisions of this General Conditions Article or to imply that the Contractor assumes or is responsible for only risks or claims of the type enumerated; and neither the enumeration in this General Conditions Article nor the enumeration elsewhere in the Contract of particular risks assumed by the Contractor or particular claims for which the Contractor is responsible shall be deemed to limit the risks which the Contractor would assume or the claims for which the Contractor would be responsible in the absence of said enumerations.

D. Notwithstanding any provision of the Contract to the contrary, and to the fullest extent permitted by law, if the Contractor does not fulfill one or more of Contractor's obligations under General Conditions Articles 14 and 15 to defend, indemnify, hold harmless, and procure insurance for the Owner, Client and Construction Manager, and the Owner, Client or Construction Manager commences a court action to enforce one or more of the Contractor's obligations to defend, indemnify, hold harmless and procure insurance for the Owner, Client and Construction Manager, the Contractor, in addition to its other obligations, shall pay the costs of the Owner, Client and Construction Manager to bring and prosecute the court action, including but not limited to attorney and consultant fees, expenses and court fees. If the Owner, Client, or Construction Manager commences a court action against an insurance company to obtain coverage under an insurance policy which the Contractor represented would provide coverage to the Owner, Client or Construction Manager, the Contractor, in addition to its other obligations, shall pay the costs of the Owner, Client, and Construction Manager to bring and prosecute the court action, including but not limited to attorney and consultant fees, expenses, and court fees.

ARTICLE 15--INSURANCE AND BONDS

Section 15.01 - General Provisions

A. The Contractor and Subcontractors shall not violate, or permit to be violated, any term or condition of their insurance policies, and shall at all times satisfy the safety requirements of the Owner and of the insurance companies issuing such policies.

B. The Contractor and Subcontractors shall maintain in force all insurance required to be procured by them under this Contract until issuance of the Notice of Physical Completion by the Owner except where this Contract requires an insurance policy to be maintained for a period beyond issuance of the Notice of Physical Completion in which case the Contractor and Subcontractors shall maintain such insurance policy in force for the specified period beyond issuance of the Notice of Physical Completion.

C. All insurance required to be procured and maintained by the Contractor and Subcontractors under this Contract shall be procured from insurance companies licensed to do business in the State of New York by the NYS Department of Financial Services and rated at least A- by A.M. Best and Company, or meet such other requirements as are acceptable to the Owner in its sole and exclusive discretion.

D. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that the policy shall not be canceled, materially changed, or not renewed without at least thirty (30) calendar days written notice to the Owner except for non-payment in which case notice to the Owner shall be provided as required by law.

E. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that at least thirty (30) calendar days prior to the expiration of the policy, evidence from the carrier of renewal or replacement of the policy by the

carrier, with terms and limits no less favorable than the expiring policy, or written notice from the carrier that the policy will not be renewed or replaced by the carrier, shall be delivered to the Owner.

F. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall be written on an occurrence basis except where this Contract explicitly allows otherwise.

G. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that the Owner and the Client shall not be responsible for any claim expenses and loss payments within the deductible or the self-insured retention and that the Contractor or Subcontractor shall be solely responsible for all claim expenses and loss payments within the deductible or self-insured retention. At any time this Contract requires the Contractor or any Subcontractor to maintain an insurance policy, the Owner may require the Contractor or any Subcontractor to provide proof, acceptable to the Owner in its sole discretion, that the Contractor or Subcontractor has assets or security sufficient to satisfy all deductible or self-insured obligations under such insurance policy for which the Contractor or Subcontractor may be liable under the claims pending or reasonably possible against the Contractor or Subcontractor at the time the Owner requires the proof. A failure of the Contractor or Subcontractor to provide such proof is a failure of the Contractor or Subcontractor to maintain the insurance required by the Contract or to provide the Owner with evidence of valid and in-force insurance coverage required by the Contract for purposes of General Conditions Section 15.05.

H. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that there shall be no right of subrogation against the Owner, Client, or Construction Manager. If any of the Contractor's policies or any of the policies of any Subcontractor prohibit such a waiver of subrogation, the Contractor or Subcontractor shall secure the necessary permission to grant this waiver of subrogation. Any and all such permission shall be confirmed by a manuscript endorsement to the relevant insurance policy or policies and a certified copy of the endorsement shall be provided to the Owner and Construction Manager.

I. Each liability and protective liability insurance policy required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that the coverage afforded the Owner, Client and Construction Manager under such policy shall be primary and non-contributory and that such policy shall be primary to any other insurance policy maintained by the Owner, by the Client or by the Construction Manager. Any other insurance policy maintained by the Owner, by the Client or by the Construction Manager shall be in excess of and shall not contribute with the Contractor's or Subcontractor's insurance policy, regardless of the "other insurance" clause contained in the Owner's, Client's or Construction Manager's own policy of insurance or the Contractor's or Subcontractor's insurance policies.

J. Any other Contract Document, including but not limited to the Information for Bidders, but excluding Change Orders, may require any of the Contractor and Subcontractors to provide at its or their expense any other form or limit of insurance necessary to secure the interests of the Owner or Client.

K. Notwithstanding any other provision of the Contract, the Owner, in a Change Order or Contract Amendment, may require the Contractor and any or all Subcontractors to provide, at the expense of the Owner, any other form or limit of insurance in addition to the insurance requirements of the original Contract necessary to secure the interests of the Owner, Client, or Construction Manager.

L. Neither the procurement nor the maintenance of any type of insurance by the Owner, the Client, the Contractor or the Construction Manager shall in any way be construed or deemed to limit, discharge,

waive or release the Contractor or any Subcontractor from any of the obligations or risks accepted by the Contractor and Subcontractors or to be a limitation on the nature or extent of said obligations and risks or to be a limitation of any obligation to defend, indemnify, hold harmless and procure insurance for the Owner, Client and Construction Manager.

M. All provisions of General Conditions Article 14 - Protection of Persons and Property and General Conditions Article 15 – Insurance and Bonds are to the fullest extent permitted by law. One purpose of this Contract is to allocate, to the fullest extent permitted by law, all risk of loss to the Contractor, each Subcontractor, and the insurers of each. Each insurance company from which Owner or Client has directly purchased an insurance policy is a third-party beneficiary of the Contractor's and each Subcontractor's obligations to procure insurance.

N. Contractor is responsible for ensuring that each Subcontractor obtains and maintains in the required amount each type of insurance policy required by this Contract and that such insurance policy provides the Owner, Client and Construction Manager with the coverage required by this Contract.

O. Contractor agrees and acknowledges that, because the Contractor (and not the Owner or Client) is responsible for performance of the duties and obligations set forth in this Contract for completion of the Project, the Contractor, through the use of insurance, intends to allocate all losses to such insurance to protect itself and the Owner and Client.

Section 15.02 - Submission of Insurance

A. Owner will not execute the Contract unless the Contractor shall submit to the Owner or the Owner's designee proof of insurance in such forms as requested and deemed acceptable by the Owner, indicating the Project, and showing evidence of all insurance required under the Contract. Upon the Owner's request, the Contractor shall provide a copy of each insurance policy required by the Contract certified by the insurance carrier as a true and complete copy. The Owner may request such a certified copy of a policy at any time and may make such requests as often as the Owner, in its sole and exclusive discretion, deems necessary. Each request may be for a certified copy of one or more policies. In addition, the Contractor shall provide copies of certificates of insurance to the Construction Manager, if applicable. Certificates of insurance, notwithstanding anything to the contrary contained on the Certificate of Insurance, when submitted to the Owner, constitute a warranty by the Contractor and its insurance agent or broker, that the insurance coverage described is in effect for the policy term shown.

B. The Contractor shall submit insurance certificates (Accord 25 and 855, or equivalent as determined by the Owner), copies of declaration pages, schedules of forms and endorsements, copies of all named insured endorsements, all endorsements of the policy granting coverage to the Owner, Client, and Construction Manager, and such other documents requested by the Owner as proof of insurance for the Contractor. All insurance submittals must be approved by the Owner prior to the Contractor's commencement of Work.

C. Upon the Owner's request, the Contractor shall submit to the Owner or Owner's designee proof of insurance for one or more Subcontractors, in such forms as requested and deemed acceptable by the Owner, indicating the Project, and showing evidence of all insurance required under the Contract. Upon the Owner's request, the Contractor shall provide a copy of each insurance policy of the Subcontractor or Subcontractors required by the Contract and certified by the insurance carrier as a true and complete copy. The Owner may request such a certified copy of a policy at any time and may make such requests as often as the Owner, in its sole and exclusive discretion, deems necessary. Each request may be for a certified copy of one or more policies for one or more Subcontractors. In addition, the Contractor shall provide copies of certificates of insurance to the Construction Manager, if applicable. Certificates

of insurance of the Subcontractors, notwithstanding anything to the contrary contained on the Certificate of Insurance, when submitted to the Owner by the Contractor, constitute a warranty by the Contractor, the Subcontractor and the Subcontractor's insurance agent or broker, that the insurance coverage described is in effect for the policy term shown.

D. Upon request of the Owner made any time after bids are opened, the Contractor shall submit insurance certificates (Accord 25 and 855, or equivalent as determined by the Owner), copies of declaration pages, schedules of forms and endorsements, copies of all named insured endorsements, all endorsements of the policy granting coverage to the Owner, Client, and Construction Manager, and such other documents requested by the Owner as proof of insurance for a Subcontractor. Owner may request proof of insurance for one or more Subcontractors at the same or at different times and may request proof of insurance for a particular Subcontractor as often as Owner, in its sole and exclusive discretion, determines is necessary.

Section 15.03 - Insurance Provided by Contractor

A. Prior to award of the Contract, the Contractor shall procure, at its sole cost and expense, and shall maintain in force at all times required by this Contract all of the insurance required under this Contract. Each Subcontractor shall procure, at its sole cost and expense, prior to the Contractor submitting to the Owner the name of such Subcontractor and prior to such Subcontractor commencing performance of any of the Work, and each Subcontractor shall maintain in force at all times required by this Contract all of the insurance required under this Contract. The insurance that the Contractor and each Subcontractor shall procure and maintain under this Contract includes, but is not limited to, the following:

1. Workers' Compensation (including occupational disease) and Employer's Liability insurance. Full New York State Workers' Compensation and Employer's Liability coverage shall be provided and evidenced by one of the following certificates **(Acord certificates are not acceptable):**

   a. C-105.2 (September '15, or most current version) - Certificate of NYS Workers' Compensation Insurance Coverage. The insurance carrier shall provide a completed form as evidence of in-force coverage.

   b. U-26.3 – (or any replacement) NYS Insurance Fund Certificate of Workers' Compensation Coverage. The NYS Insurance Fund shall provide a completed form as evidence of in-force coverage.

   c. GSI-105.2(2/02 or most current version) - Certificate of Participation in Workers' Compensation Group Board-approved self-insurance. The NYS Workers' Compensation Board's Self Insurance Office or the Contractor's Group Self Insurance Administrator shall provide a completed form.

   d. SI-12 (5/09 or most current version) Affidavit Certifying That Compensation Has Been Secured. The NYS Workers' Compensation Board's Self Insurance Office or the Contractor's Self Insurance Administrator shall provide a completed form.

2. Disability Benefits insurance. Full New York State Disability Benefits coverage for the benefit of such employees as are required to be covered by the New York State Disability Benefits Law shall be provided and evidenced by one of the following certificates:

a. DB-120.1 (September 15, or most current version) - Certificate Of Insurance Coverage Under the NYS Disability Benefits Law.

b. DB-155 (9/16) – Compliance with Disability Benefits Law. The NYS Workers' Compensation Board's Self Insurance Office shall provide a completed form.

c. CE 200 Certificate of Attestation of Exemption. (Note: this form will only be accepted as evidence of an exemption from providing Disability Benefits insurance as required by law. The Dormitory Authority will not accept this as an exemption from providing Worker's Compensation Insurance.) The Certificate may be obtained from the NYS Workers Compensation Board's website at http://www.wcb.state.ny.us. The CE 200 cannot be used for multiple projects; therefore, a new form shall have to be completed prior to award of any subsequent contract.

3. Commercial General Liability (CGL) insurance. The CGL insurance policy shall cover the liability of the Contractor or Subcontractor for bodily injury, property damage, and personal/advertising injury arising from performance of the Work or operations or presence at or in the vicinity of the Site of the Contract. The policy shall utilize ISO form CG 00 01 12 07 or a form providing equivalent coverage. The limits under such policy shall not be less than the following: the limit for each occurrence shall be at least $2,000,000; the general aggregate limit shall be at least $2,000,000; the personal and advertising injury limit shall be at least $1,000,000; and the Products Completed Operations limit shall be at least $2,000,000. The limits may be provided through a combination of primary and umbrella and/or excess liability policies. Coverage shall provide and encompass at least the following:

a. If the Contractor or Subcontractor proposes the use of a policy other than the ISO form CG 00 01 12 07, the Contractor or Subcontractor shall provide the proposed policy to the Owner which, in its sole and exclusive discretion, will determine whether the proposed policy provides equivalent coverage. The Contractor or Subcontractor shall pay Owner any attorney fees and other costs incurred by Owner in determining whether the proposed policy provides equivalent coverage. Owner will select the attorney providing advice on the proposed policy.

b. ISO Endorsement Forms CG 20 10 11/85 and CG 20 37 10 01, or their equivalents, specifically naming as additional insureds the Dormitory Authority and Client and if applicable, the Construction Manager and other entities specified on the sample certificate of insurance provided by the Owner in the bidding documents and for form CG 20 37 10 01 or its equivalent, specifically listing the Project location.

c. If the Contractor or Subcontractor proposes the use of an endorsement or endorsements other than the ISO Endorsement Forms CG 20 10 11/85 and CG 20 37 10 01, the Contractor or Subcontractor shall provide the proposed endorsement(s) to the Owner which, in its sole and exclusive discretion, will determine whether the proposed endorsements provide equivalent coverage. Contractor and Subcontractor shall pay Owner any attorney fees and other costs incurred by Owner in determining whether the proposed endorsements provide equivalent coverage. Owner will select the attorney providing advice on the proposed endorsements.

d. Additional insured status for Owner, Client and Construction Manager shall apply during the Products/Completed Operations phase as well as during the course of performance of the Work.

e. The policy provisions required by General Conditions Section 15.01.

f. Excavation, Collapse and Underground Hazards.

g. Independent contractors/subcontractors.

h. Blanket Written Contractual Liability covering all indemnity agreements, including all indemnity obligations contained in the Contract, and covering tort liability of another assumed in a contract.

i. Products and completed operations coverage for a term no less than three years commencing upon issuance by the Owner of the Notice of Physical Completion.

j. Premises liability.

k. Defense and/or indemnification obligations, including obligations assumed under this Contract.

l. Cross liability for additional insureds.

m. Contractor and Subcontractor means and methods.

n. Liability resulting from Section 240 or Section 241 of the NYS Labor Law.

o. ISO Endorsement CG 25 03 11 85 or its equivalent applying the policy's general aggregate limit separately to the Project.

p. The maximum deductible or self-insured retention shall be $50,000.

q. No endorsement or provision in the policy shall exclude coverage for Owner, Client, or Construction Manager for any liability when the injured party is an employee of Contractor or any Subcontractor.

r. No endorsement or provision in the policy shall require privity of contract between the Owner and Subcontractor or between the Client and the Contractor or Subcontractor or between the Construction Manager and the Contractor or Subcontractor in order for the Owner, the Client, or the Construction Manager to have coverage as an insured on such insurance policy.

s. If the Contractor or Subcontractor must provide a Railroad Protective Liability insurance policy, the CGL exclusion for work within fifty (50) feet of railroad property must be deleted.

t. No endorsement or provision in the policy shall have a height limitation or exclusion.

u. No endorsement or provision in the policy shall have a classification exclusion as respects work performed for the Owner, Client, and Construction Manager.

v. Owner, Client, and Construction Manager shall be covered for any and all liability arising out of acts or omissions of Contractor and any Subcontractor.

4. Commercial Automobile Liability insurance. The Commercial Automobile Liability insurance policy shall cover liability arising out of the use of any motor vehicle in connection with the Contract, including owned, leased, hired and non-owned vehicles bearing or, under the circumstances under which they are being used, required by the laws of NYS to bear, license plates. The policy shall have a combined single limit for bodily injury and property damage of at least

$1,000,000. The limit may be provided through a combination of primary and umbrella and/or excess liability policies. If the Contract involves the removal of hazardous waste or otherwise transporting Hazardous Materials, pollution liability coverage for covered autos shall be provided by endorsement CA 99 48 03 06 or CA 00 12 03 06 and the Motor Carrier Act Endorsement (MCS90) shall be attached to the policy.

5. Umbrella and/or Excess Liability insurance. When the limits of the CGL, Commercial Auto Liability or Employers' Liability policies procured are insufficient to meet the limits specified in the preceding paragraphs, Commercial Umbrella or Excess Liability policies shall be procured and maintained provided, however, that the total amount of insurance coverage is at least equal to the requirements specified in the preceding paragraphs. The Commercial Umbrella or Excess Liability policies shall follow the same form as the CGL, Commercial Automobile Liability and Employers Liability insurance policies required in the preceding paragraphs. The Umbrella and/or Excess Liability policies shall be primary to any other insurance maintained by the Owner or Client or Construction Manager or any other additional insured. Any other insurance maintained by the Owner, the Client, the Construction Manager, or any other additional insured shall be in excess of and shall not contribute with the Contractor's or Subcontractor's Umbrella or Excess Liability insurance policies, regardless of the "other insurance" clause contained in the Owner's or Client's or Construction Manager's or other additional insured's own policy of insurance or the Contractor's or Subcontractor's insurance policies.

6. The Contractor shall secure, pay for, and maintain property insurance necessary for protection against the loss of owned, borrowed or rented capital equipment and tools, including any tools owned by employees, and any tools or equipment, staging towers, and forms owned, borrowed, or rented by the Contractor. The requirement to secure and maintain such insurance is solely for the benefit of the Contractor. Failure of the Contractor to secure such insurance or to maintain adequate levels of coverage shall not render the Owner, Client and, if applicable, the Construction Manager and other entities specified as additional insureds on the sample certificate of insurance provided by the Owner in the bidding documents or their agents and employees responsible for any losses; and the Owner, Client and, if applicable, the Construction Manager and other entities specified as additional insureds on the sample certificate of insurance provided by the Owner in the bidding documents and their agents and employees shall have no such liability.

B. Notwithstanding any other provision of the Contract to the contrary and to the fullest extent permitted by law, Contractor shall be liable for all costs and fees, including counsel fees, incurred by or on behalf of the Owner, the Client or the Construction Manager in any action brought by or against the Owner, Client or Construction Manager concerning insurance coverage owed to Owner, Client or Construction Manager by any insurer for which Contractor or any Subcontractor represented that the Owner, Client and Construction Manager would be an insured or would benefit in any way if a claim was brought against Owner, Client and Construction Manager .

Section 15.04 - Other Insurance Provided by Contractor

The Contractor and each Subcontractor shall also procure and maintain as required by General Conditions Sections 15.01 B and 15.03 A the following insurance:

A. United States Longshore and Harbor Workers' Compensation Act and Jones Act: When, to perform the Work, the Contractor or any Subcontractor is engaged in activities on or near a shoreline or on or near the navigable waterways of the United States or when any part of the Work is connected to water related activities, the Workers' Compensation policy referenced above of the Contractor and any such

Subcontractor shall be endorsed to provide Jones Act and United States Longshore and Harbor Workers' Act coverage.

B. Contractor's Pollution Liability insurance: When the Work includes abatement, removal, repair, replacement, enclosure, encapsulation or disposal of any pollutants, which include but are not limited to, petroleum, petroleum products, mold, asbestos, lead or any other Hazardous Material, the Contractor or any Subcontractor performing Work involving any of the pollutants, shall procure and maintain in full force and effect pollution legal liability insurance with limits of at least $2,000,000 providing coverage for bodily injury and property damage, including loss of use of damaged property or of property that has not been physically injured and coverage that encompasses at least the following:

1. Endorsement specifically naming as additional insureds: Dormitory Authority, the Client, and if applicable, the Construction Manager and other entities specified on the sample certificate of insurance provided by the Owner in the bidding documents.

2. The policy provisions required by General Conditions Section 15.01.

3. A maximum deductible or self-insured retention of $50,000.

4. Coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants, including any loss, cost or expense incurred as a result of any cleanup of pollutants or in the investigation, settlement or defense of any claim, suit or proceedings against the Owner, Client or Construction Manager arising from the Work.

5. Coverage shall be provided until three years after the Owner issues the Certificate of Physical Completion.

C. Railroad Protective Liability insurance: If any Work of the Contract is to be performed on or within fifty (50) feet of a railroad property or railroad right of way or will require entrance upon railroad property or right of way or will require assignment of a railroad employee, the Contractor shall provide and maintain a Railroad Protective Liability policy with the policy limits required by the owner(s) of the railroad. For purposes of this paragraph, a subway is a railroad. The policy form shall be ISO-RIMA or an equivalent form approved by the owner(s) of the railroad. The railroad owner(s) shall be the named insured on the policy and the definition of "physical damage to property" shall mean direct and accidental loss of or damage to all property of any named insured and all property in any named insured's care, custody, or control. If the Contractor shall provide a Railroad Protective Liability insurance policy, the Contractor and any Subcontractor performing on or within fifty (50) feet of railroad property or railroad right of way or entering railroad property or right of way or requiring assignment of a railroad employee shall have their CGL insurance policy endorsed to delete the exclusion of coverage for Work within fifty (50) feet of railroad property.

D. Professional Liability insurance: Each of the Contractor and any Subcontractor performing any Work which involves delegation of design shall procure and maintain Error and Omissions Liability Insurance for the delegated design Work with a minimum insurance limit of not less than two (2) million dollars issued to and covering damage for liability imposed on the Contractor or Subcontractor by this Contract or law arising out of any negligent act, error, or omission in the rendering of or failure to render professional services required by this Contract. This insurance may be issued on a claims-made policy form and shall be maintained for no less than three (3) years after issuance by the Owner of the Notice of Physical Completion. The policy, at the sole expense of the Contractor or Subcontractor, shall have extended Discovery Clause coverage of at least three (3) years after issuance by the Owner of the Notice

of Physical Completion if the policy is cancelled or not renewed. The maximum deductible or self-insured retention is $100,000.

E. Marine Protection & Indemnity insurance and Hull & Machinery insurance: Each of the Contractor and any Subcontractor performing any Work on navigable water or connected to water-related activities or with marine operations, shall procure and maintain Marine Protection & Indemnity insurance and Hull & Machinery insurance. Hull & Machinery coverage shall be provided for the total value of the watercraft and equipment used in the Work on navigable water or connected to water-related activities or with marine operations. The Contractor shall obtain a Marine Protection & Indemnity Liability insurance policy for all navigable water, water-related or marine activities or operations under the Contract with a minimum limit of $2,000,000. The Owner, the Client and, if applicable, the Construction Manager and other entities specified on the sample certificate of insurance provided by the Owner in the bidding documents shall be additional insureds on the Marine Protection & Indemnity Liability insurance policy. The Marine Protection & Indemnity Liability insurance policy shall provide coverage that encompasses at least the following:

1. The policy provisions required by General Conditions Section 15.01.

2. A maximum deductible or self-insured retention of $50,000.

3. Coverage shall be provided until the Owner issues the Certificate of Physical Completion.

4. Endorsement specifically naming as additional insureds: Dormitory Authority, the Client, and if applicable, the Construction Manager and other entities specified on the sample certificate of insurance provided by the Owner in the bidding documents.

Section 15.05 - Stop Work Order - Insurance

A. All insurance certificates are valid for one (1) year from the date the certificate is signed/stamped, or until policy expiration, whichever is earlier. The Contractor shall be responsible to submit updated insurance certificates thirty (30) calendar days prior to any insurance certificate expiration date.

B. Failure of the Contractor or any Subcontractor to maintain the insurance required by the Contract or to provide the Owner with evidence of valid and in-force insurance coverage required by the Contract shall result in a Stop Work Order pursuant to General Conditions Article 11 – Termination or Suspension and/or withholding of payment to the Contractor.

C. At any time that the coverage provisions and limits on the policies required herein do not meet the provisions and limits set forth above, the Contractor or Subcontractor shall immediately cease Work on the Project. The Contractor or Subcontractor shall not resume Work on the Project until authorized to do so by the Owner.

D. Any delay or time lost as a result of the Contractor or Subcontractor not having proper insurance required by this General Conditions Article or not providing the Owner with evidence of valid and in force insurance required by the Contract shall not give rise to a delay Claim or any other Claim against the Owner. Further, the Contractor may be liable to other contractors for costs incurred by reason of the Contractor's or Subcontractor's failure to provide insurance.

Section 15.06 – Builder's Risk

A. The Owner will provide Builder's Risk insurance for all projects, except for those projects listed in paragraph B of this General Conditions Section 15.06.

1. The Owner shall, except as otherwise specified, at all times beginning with the Notice to Proceed and until Substantial Completion, procure and maintain, at the Owner's sole cost and expense, "All Risk" Builder's Risk insurance. The Contractor and Subcontractors will be covered for the Work of the Contract, except losses up to and including the deductible shall be borne by the Contractor. The Owner shall, at the Owner's sole discretion, have the power to adjust and to settle with the insurer any loss or claim under the Builder's Risk insurance. Reimbursement for loss, if any, shall be made payable to the Owner. The deductible is stated in the Information for Bidders.

2. Coverage shall include sub limits for property in transit and for property in storage on and off the Site. Specific higher limits for transit or for storage may be available as circumstances may require upon written request by the Contractor or any Subcontractor to the Owner at least 30 calendar days before such higher limit would take effect if the request is granted. Owner in its sole and exclusive discretion may grant or deny the request for a higher limit for transit or storage. If the Owner denies the request, the Contractor or Subcontractor shall have no Claim against the Owner for any cost or damage. If the Owner grants the request, the Owner may condition the grant upon the Contractor or Subcontractor paying the additional cost for the higher limit for transit or storage.

3. No coverage shall be provided to the Contractor or any Subcontractor under any property insurance policy of the Owner or Client which only covers completed, occupied structures.

B. The Contractor shall procure and maintain, at its sole cost and expense, Builder's Risk insurance for all OMH, OPWDD, OASAS, NYCHA, and HTFC-GOSR projects, or when otherwise specified, as provided below.

1. The Contractor shall maintain until the date of Physical Completion, an All Risk Builder's Risk Completed Value Form insurance policy, with coverage for at least the value of the Work of the Contract except for excavation work, planting and seeding, and Work buried in the ground other than wiring and walking tunnels, but including debris removal costs and architect, engineering and other costs to evaluate damage and provide any design or other services necessary to correct or minimize damage in the event of damage to the Work covered by the policy or such higher amount of coverage as required by the Owner in this Contract. Debris removal costs shall include demolition as may be necessary by the operation of any law, ordinance, or regulation. The policy shall cover property of the Owner or Client when in the Contractor's care, custody, or control. The policy shall name as insureds the Owner, Client and Contractor and shall include such soft costs coverage for the Owner and Client as specified in this Contract. The extended coverage endorsement may include a loss deductible of $10,000 or less. The Contractor shall bear all losses up to and including the deductible provision.

2. Coverage shall also include sub limits for equipment, material, and other property in transit or in storage on or off the Site. Specific higher limits of coverage for property in transit or storage, at Contractor's expense, may be required by the Owner due to circumstances of the Project.

3. Each Builder's Risk insurance policy shall include the following endorsement:

   "It is made a condition of this insurance that until the Owner issues the Notice of Physical Completion to the Contractor, occupancy of the premises shall not require consent of the insurer, nor shall such occupancy be the basis for a rate adjustment."

4. Builder's Risk insurance policy shall name the Dormitory Authority and the Contractor Loss Payees in order of precedence, as their interests may appear and shall run until the date of Physical Completion. Policies expiring on a fixed date before Physical Completion shall be renewed not less than thirty (30) calendar days before such expiration date. Such policy shall not be changed by endorsement without the knowledge and consent of the Owner and in particular, shall provide that no notice of cancellation by the insurer shall be effective until sixty (60) calendar days after such notice is received by the Owner. If the policy is issued by a mutual insurance company, the policy shall provide that the Owner and the Client shall not be liable for any premium or assessment under the policy; the Contractor shall be responsible for all premiums and assessments.

5. The Owner may withhold the Contractor's payment for Work which is required to be insured until original binder or policies for the Builder's Risk insurance are provided to the Owner pursuant to General Conditions Section 15.06.

Section 15.07 - Bonds Provided by Contractor

A. The Contractor shall provide the Performance Bond in an amount at least equal to 100% of the Contract sum as security for the faithful performance of the Contract. The Contractor shall also provide the Payment Bond in an amount at least equal to 100% of the Contract sum for the payment of all persons performing labor or providing materials in connection with the Work of the Contract. The Contractor shall execute the Performance Bond form and the Payment Bond form included in the Contract Documents.

B. If at any time the Owner, in its sole and exclusive discretion, shall become dissatisfied with any surety or sureties upon the Performance Bond or the Payment Bond, or if for any other reason said bonds shall cease to be adequate security to the Owner, the Contractor shall, within five (5) calendar days after written notice from the Owner to do so, substitute an acceptable bond or bonds in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The Contractor shall pay the premiums on said bond or bonds. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond or bonds to the Owner.

C. The surety company, on all bonds, shall be authorized to do business in the State of New York by the NYS Department of Financial Services and rated at least A- by A.M. Best and Company, or meet such other requirements as are acceptable to the Owner in its sole and exclusive discretion.

ARTICLE 16 -- GENERAL PROVISIONS of the CONTRACT

Section 16.01 - General Law Provisions

A. This Contract and its enforcement, and any controversy arising out of or relating to the making or performance of this Contract, shall be governed by and construed in accordance with the law of the State of New York, without regard to the New York principles of conflicts-of law and except where the United States supremacy clause requires otherwise.

B. Each and every provision of law and clause required by law to be inserted in the Contract shall be deemed to be inserted therein and the Contract shall read and shall be enforced as though so included therein.

C. The Contractor shall comply fully with all applicable laws, rules, and regulations, and as applicable, Building Code of New York State or Building Code of the City of New York.

D. The Contractor agrees that the Contract shall be deemed executory to the extent of moneys available from either: (1) the proceeds of bonds issued by the Dormitory Authority for the Contract, (2) moneys made available by the Client to the Owner for the Contract, (3) other moneys made available to the Owner from whatever source specifically for the Contract and no liability shall be incurred by the Owner beyond moneys available therefore.

E. The relationship created by the Contract between the Owner and the Contractor is one of an independent contractor and it is no way to be construed as creating an agency relationship between the Owner and the Contractor nor is it to be construed as, in any way or under any circumstances, creating or appointing the Contractor as an agent of the Owner for any purpose whatsoever.

F. The Client is an intended third-party beneficiary of the Contract for the purposes of recovering any damages incurred by the Client and caused by the Contractor.

G. The Contractor shall not assign the Contract in whole or in part without prior written consent of the Owner. Any attempt to assign the Contract in whole or in part without prior written consent of the Owner is null and void. As a condition to consent to the assignment, the Owner shall require each proposed assignee to establish, to the satisfaction of the Owner in its sole and exclusive discretion, that the assignee is responsible and, if applicable, has the experience to perform the Work. If the Owner consents to an assignment and if the Contractor assigns all or part of any moneys due or to become due under the Contract, the instrument of assignment shall contain a clause substantially to the effect that the Contractor and assignee agree that the assignee's right in and to any moneys due or to become due to the Contractor shall be subject to all prior claims for services rendered or materials supplied in connection with the performance of the Work. The Owner reserves the right to assign this Contract in whole or in part without the consent of the Contractor.

H. Nothing in the Contract shall create or shall give to third parties any claim or right of action against the Owner, the State of New York, the Client, and the Construction Manager, or any institution at which the Work is being carried out beyond such as may legally exist irrespective of the Contract.

I. The Owner is exempt from the terms of fair trade agreements for sales to the Contract.

J. Inasmuch as the Contractor can be compensated adequately by money damages for any breach of the Contract which might be committed by the Owner, the Contractor agrees that no default, act or omission of the Owner shall constitute a material breach of the Contract entitling the Contractor to cancel or rescind the Contract or to suspend or abandon performance of the Contract; and the Contractor hereby waives any and all rights and remedies to which the Contractor might otherwise be or become entitled to because of any wrongful act or omission of the Owner saving only the Contractor’s right to money damages.

K. No action or proceeding shall lie or shall be maintained by the Contractor, nor anyone claiming under or through the Contractor, against the Owner upon any Claim arising out of or based upon the Contract, relating to the giving of notices or information.

L. No action or proceeding shall lie in favor of or shall be maintained by the Contractor against the Owner unless such action shall be commenced within one year after the earliest following event:

1. The date the Owner executes the Notice of Physical Completion.

2. Receipt, by the Owner, of the Contractor's final Application for Payment, if no Notice of Physical Completion is issued.

3. The date of termination if the Owner terminates the Contract.

M. The Owner and Contractor agree to submit to the exclusive jurisdiction of the Commercial Division, New York Supreme Court, which shall hear any dispute, Claim or controversy arising in connection with or relating to this Contract, including, but not limited to the validity, breach, enforcement, or termination thereof.

N. No action or proceeding shall be brought against the Owner in any location other than Albany County unless the Owner specifically consents, in writing, to a change of venue.

O. If the Contractor obtains a judgment against the Owner in any action or proceeding, the Contractor agrees to accept no more than three percent (3%) interest, per annum, on the amount of the judgment.

Section 16.02 - Diesel Emissions Reduction

A. The Contractor shall certify that heavy duty vehicles, as defined in the NYS Environmental Conservation Law (ECL) Section 19-0323 and Title 6 of the New York Codes Rules and Regulations, Part 248 (6 NYCRR 248), will comply with the rules, regulations and provisions pursuant to ECL Section 19-0323, and 6 NYCRR 248, which requires the use of Best Available Retrofit Technology and Ultra Low Sulfur Diesel to the extent required by law unless specifically waived by the NYS Department of Environmental Conservation (DEC). Qualification for a waiver will be the responsibility of the Contractor.

B. Annually, as required by DEC, but no later than March 1st, the Contractor shall complete and submit directly to the Owner, via electronic mail, the Regulated Entity Vehicle Inventory Form and Regulated Entity and the Contractors Annual Report Form, found on the DEC website http://www.dec.state.ny.gov for vehicles used on the Project for the preceding calendar year.

C. The Contractor shall certify to the Owner, and submit with each Application for Payment, the Contractor and Subcontractor Certifications form, which states that the Contractor agrees to comply with the provisions of General Conditions Section 16.02.

Section 16.03 – State and Federal Labor Law Provisions

A. All applicable provisions of NYS Labor Law shall be carried out in the performance of the Work.

B. The Contractor specifically agrees, as required by NYS Labor Law, Sections 220 and 220-d as amended, that:

1. No worker, in the employ of the Contractor, any Subcontractor or any other person doing or contracting to do the whole or any part of the Work contemplated by the Contract shall be permitted or required to work more than eight (8) hours in any one (1) calendar day and more than five (5) days in any one week, except in the extraordinary emergencies set forth in NYS Labor Law.

2. The wages paid for a legal day's work shall be not less than the prevailing rate of wages as defined by NYS Labor Law. Each laborer, worker or mechanic employed by the Contractor, any Subcontractor or any other person doing or contracting to do the whole or any part of the Work contemplated by the Contract shall be paid not less than the prevailing rate of wages as defined by NYS Labor Law and shall be provided not less than the supplements as required by NYS Labor Law.

3. The minimum hourly rate of wage to be paid and supplements provided shall be not less than that required by the NYS Labor Law and as shall be designated by the Commissioner of Labor of the State of New York.

4. The Contractor and all Subcontractors shall post in a prominent and accessible place on the Site, a legible statement of all minimum wage rates and supplements to be paid or provided for the various classes of workers engaged in the performance of the Work and all deductions, if any, required by law to be made from unpaid wages actually earned by any worker so engaged.

5. The Contractor and all Subcontractors shall provide each worker a written notice of the prevailing wage rate for each of the worker's particular job classifications on each pay stub and, as required by the NYS Labor Law, written notice that includes the telephone number and address for the Department of Labor and a notice informing all workers of their right to contact the Department of Labor if a worker is not receiving the proper prevailing rate of wages and/or supplements for a worker's particular job classification.

6. The Contractor shall be responsible for obtaining prevailing wage rate updates directly from the NYS Department of Labor, either by accessing its website http://www.labor.state.ny.us or a written request to the Bureau of Public Works.

C. The minimum wage rates, if any, specified for apprentices shall apply only to persons working with the tools of the trade which such persons are learning under the direct supervision of journeyman mechanics as an individual registered in an apprenticeship program which is duly registered with the Commissioner of Labor of the State of New York in conformity with the NYS Labor Law. Except as otherwise required by law, the number of apprentices in each trade or occupation employed by the Contractor or any Subcontractor shall not exceed the number permitted by the applicable standards of the NYS Department of Labor, or, in the absence of such standards, the number permitted under the usual practice prevailing between the unions and the employers' association of the respective trades or occupations.

D. All workers of the Contractor and all Subcontractors shall be paid in accordance with the provisions of the NYS Labor Law. The Contractor and all Subcontractors shall submit to the Owner original copies of the Contractor and Subcontractor Certifications form and Certified Payroll forms in accordance with payment procedures and otherwise upon request. The Contractor and all Subcontractors shall prepare and keep original payrolls or transcripts thereof in compliance with NYS Labor Law Section 220, subdivision 3-a, and shall file transcripts of such payrolls with the Owner as required by NYS Labor Law Section 220, subdivision 3-a. Filing the transcripts of such payrolls with the Owner as required by NYS Labor Law Section 220, subdivision 3-a is a condition precedent to payment of any sums due and owing Contractor or any Subcontractor for Work performed upon the Project.

E. The Contractor agrees that, in case of underpayment of wages to any worker engaged in the Work by the Contractor or any Subcontractor, the Owner shall withhold from the Contractor out of payments due an amount sufficient to pay such worker the difference between the wages required to be paid under

the Contract and the wages actually paid such worker for the total number of hours worked, and that the Owner may disburse such amount so withheld by the Owner for and on account of the Contractor to the worker to whom such amount is due. The Contractor further agrees that the amount to be withheld pursuant to this paragraph may be in addition to the amounts and percentages to be retained by the Owner pursuant to other provisions of the Contract.

F. Pursuant to subdivision 3 of Section 220 and Section 220-d of the NYS Labor Law the Contract shall be forfeited and no sum paid for any Work done thereunder upon a Contractor's or Subcontractor's second conviction for willfully paying or providing less than:

1. The stipulated wage scale or supplement as established by the fiscal officer.

2. The stipulated minimum hourly wage scale and supplements as designated by the Commissioner of Labor of the State of New York.

G. If the project is Federally funded in part or whole and therefore subject to the requirements of the Davis Bacon Act, the U.S. Department of Labor's government-wide implementation of the Act, or to Federal program legislation, the Contractor shall pay the higher of either NYS Department of Labor prevailing wage rates or wages established for the locality of the project by the U.S. Department of Labor.

H. The Contractor specifically agrees that all workers engaged on the Site, whether employees of the Contractor, Subcontractor, or other person performing or contracting to do any part of the Work, shall be certified, prior to performing any Work, as having successfully completed the OSHA 10-hour construction safety and health course as required by NYS Labor Law Section 220-h.

Section 16.04 - Nondiscrimination

A. To the extent required by Article 15 of the NYS Executive Law (also known as the Human Rights Law) and all other NYS and United States statutory and constitutional non-discrimination provisions, the Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, sex (including gender identity or expression), national origin, sexual orientation, military status, age, disability, predisposing genetic characteristics, marital status or domestic violence status.

B. If the Contractor is directed to do so by the Owner, the Contractor shall request each employment agency, labor union or authorized representative of workers with which the Contractor has a collective bargaining agreement or other agreement or understanding, to furnish a written statement that such employment agency, labor union or representative will not discriminate on the basis of race, creed, color, sex, national origin, age, disability or marital status, and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations under Articles 15 and 15A of the NYS Executive Law.

C. The Contractor shall state, in all solicitations or advertisements for employees, that in the performance of the Contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability, or marital status.

D. The Contractor shall include the provisions of paragraphs A, B, and C of this General Conditions Section 16.04 in every Subcontract and purchase order in such a manner that such provisions will be binding upon each Subcontractor and vendor as to the operations for the Contract to be performed within the State of New York.

E. Pursuant to NYS Labor Law, Section 220-e, the Contractor specifically agrees:

1. That in the hiring of employees for the performance of Work under the Contract or any subcontract hereunder, or for the manufacture, sale or distribution of materials, equipment or supplies hereunder, but limited to operations performed within the territorial limits of the State of New York, no Contractor, Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the Work to which the employment relates.

2. That no Contractor, Subcontractor, nor any person on behalf of such Contractor or Subcontractor shall, in any manner, discriminate against or intimidate any employee hired for the performance of Work under the Contract on account of race, creed, color, disability, sex, or national origin.

3. That there may be deducted from the amount payable to the Contractor, by the Owner under the Contract, a penalty of fifty dollars ($50.00) for each person for each calendar day during which such person was discriminated against or intimidated in violation of the terms of the Contract.

4. That the Contract may be canceled or terminated by the Owner and all moneys due or to become due hereunder may be forfeited for a second or any subsequent violation of the terms or conditions of this Section 16.04 E of the Contract.

Section 16.05 - Domestic Steel

The Dormitory Authority is required to comply with all provisions of Title 4 of Article 9 of the NYS Public Authorities Law, including NYS Public Authorities Law Section 2603-a, and in accordance therewith, if the amount of the Contract exceeds $100,000, the Owner requires that all structural steel, reinforcing steel or other major steel items to be incorporated in to the Work of the Contract be produced or made in whole or substantial part in the United States, its territories, or possessions. The Owner, in its discretion, may grant waivers of this requirement in accordance with NYS Public Authorities Law Section 2603-a. Contractor must request a waiver in writing and obtain a written waiver of this requirement from Owner before using in performance of the Contract any steel not produced or made in whole or substantial part in the United States, its territories, or possessions.

Section 16.06 - Failure to Comply with Article 16

The Owner will not be responsible for any Claim arising from compliance with this General Conditions Article 16.

ARTICLE 17—RECORDS/AUDITS/INVESTIGATIONS/ETHICS

Section 17.01 – Preparation of Records/Owner's Right to Inspect Records and to Audit

The Contractor shall, concurrently with performance of the Contract, prepare substantiating records regarding performance of the Contract, including records of Subcontractors and material suppliers. General Conditions Section 17.03 describes the records and other data to be maintained by Contractor, Subcontractors, and material suppliers. The Contractor shall maintain and keep, for a period of at least six (6) years after the date of payment of the final Application for Payment, all records and other data relating to the Work, including records of Subcontractors and material suppliers. Upon seven (7) calendar days' written notice, the Contractor shall make its records (including records of Subcontractors and material suppliers) available during normal business hours to the Owner or its authorized representative(s). Owner

and its authorized representative(s) shall be entitled to inspect, examine, review and copy the Contractor's records (including records of Subcontractors and material suppliers) at the Owner's reasonable expense, within adequate workspace at the Contractor's facilities. The Owner shall also have the right to have Owner or its authorized representative audit all records and other data of the Contractor, Subcontractors and material suppliers relating to the Work.

Section 17.02- False Statements/Information/Disclosure

Failure to comply with General Conditions Section 17.01, providing False Representations, false statements or inaccurate information submitted in accordance with Contract Documents, including but not limited to, an Application for Payment, a Claim or a Change Order, or False Representations, false statements, or inaccurate information submitted to the Owner, or a determination that the Contractor participated in the kick-back of wages may result in one or more of the following actions:

A. Termination of the Contract for cause, pursuant to General Conditions Section 11.01.

B. Rejection of future bids or disapproval of a contract or subcontract.

C. Withholding of payments.

D. Criminal prosecution.

E. Civil prosecution under Article XIII of the NYS State Finance Law – the New York False Claims Act.

F. Rejection of a Claim or Change Order.

G. Deduction of the Owner's cost of an audit from the Contract amount.

Section 17.03 - Owner's Right to Conduct Investigations

A. The Contractor agrees to cooperate fully and faithfully with any investigation, audit or inquiry conducted by the Owner.

B. The Contractor shall grant the Owner the right to examine all books, records, files, accounts, computer records, documents, and correspondence, including electronically-stored information, in the possession or control of the Contractor, its subsidiaries and affiliated companies and any other company directly or indirectly controlled by the Contractor, relating to the Contract. These shall include, but not be limited to: Subcontracts; bid files; payroll and personnel records; cancelled checks; correspondence; memoranda; daily reports of Work completed that day; schedules; reports; audits; vendor qualification records; original estimate files; Change Order/Contract Amendment estimate files; detailed worksheets; Subcontractor, consultant and supplier proposals for both successful and unsuccessful bids; back-charge logs; any records detailing cash, trade, or volume discounts earned; insurance proceeds, rebates or dividends received; payroll and personnel records; tax returns; and the supporting documentation for the aforesaid books and records.

C. At the Owner's request, said materials shall be provided in a computer readable format, where available. At the request of the Owner, the Contractor shall execute such documents, if any, as are necessary to give the Owner access to Contract-related books, documents, or records, which are, in whole or part, under control of the Contractor but not currently in the Contractor's physical possession. The Contractor shall not enter in to any agreement with a Subcontractor, consultant, or supplier, in

connection with the Contract, that does not contain a right to audit clause in favor of the Owner. The Contractor shall assist the Owner in obtaining access to past and present Subcontractor, consultant, and supplier amendment/change order files (including detailed documentation covering negotiated settlements), accounts, computer records, documents, correspondence, and any other books and records in the possession of Subcontractors, consultants and suppliers pertaining to the Contract, and, if appropriate, enforce the right-to-audit provisions of such agreements.

D. The Contractor shall assist the Owner in obtaining access to, interviews with, and information from all former and current persons employed and/or retained by the Contractor, for purposes of the Contract.

E. The Contractor shall require each Subcontractor to include in all agreements that the Subcontractor may hereinafter enter in to with any and all Subcontractors, consultants, and suppliers, in connection with the Contract, a right-to-audit clause in favor of the Owner conferring rights and powers of the type outlined in this General Conditions Section 17.03. The Contractor shall not enter in to any Subcontract with a Subcontractor in connection with the Contract that does not contain such a provision. The Contractor shall not make any payments to a Subcontractor, consultant, or supplier from whom the Contractor has failed to obtain and supply to the Owner complete, accurate, and truthful information in compliance with a request from the Owner to the Contractor.

F. Any violation of the provisions of this General Conditions Article 17 shall justify termination of this Contract and may result in the Owner's rejection of the Contractor's bids or proposals for future contracts and the deduction of the Owner's cost of an audit from the Contract amount.

Section 17.04 - Disclosure of Criminal Investigation

A. The Contractor shall immediately notify the Owner in the event that any owner, partner, director, officer or employee of the Contractor, or its affiliated companies as identified in the NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2), are subpoenaed or questioned in connection with any business-related criminal investigation, whether or not the owner, partner, director, officer or employee is, or is believed to be, the subject or target of such investigation, or is notified or otherwise learns that any owner, partner, director, officer or employee of the Contractor or its affiliated companies is under investigation for an alleged business-related violation of criminal law, or in the event that any premises or records of the Contractor are searched pursuant to a search warrant seeking evidence of a crime or crimes, unless otherwise precluded by law enforcement authorities.

B. The Contractor shall immediately notify the Owner in the event that any owner, partner, director, officer or employee of the Contractor or its affiliated companies as identified in the NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2), the firm itself, or one of its affiliated companies is indicted or charged in an accusatory instrument for any business-related violation of local, state or federal criminal law, unless otherwise precluded by law enforcement authorities.

C. In the event that any owner, partner, director, officer, or employee of the Contractor is indicted or charged in an accusatory instrument for any business-related violation of local, state, or federal criminal law relating to this Contract or any other Dormitory Authority contract, the Owner may require the Contractor to remove said owner, partner, director, officer, or employee from any direct involvement in the affairs of the Contractor as it relates to this Contract and all other Dormitory Authority contracts until the criminal matter is resolved. In the event that any owner, partner, director, officer, or employee of the Contractor is convicted of a business-related violation of local, state, or federal criminal law, the Owner may require the Contractor to permanently remove said individual from any direct involvement in the affairs of this Contract and all other Dormitory Authority contracts.

D. In the event that the Contractor or any owner, partner, director, officer, or employee of the Contractor is convicted of a business-related violation of local, state, or federal criminal law, the Owner may schedule a hearing with the Contractor to determine the Contractor's responsibility to continue work under this Contract and other Dormitory Authority contracts. Following this hearing, the Owner may, at its sole discretion, take one or more of the following actions:

    1. Terminate this Contract.

    2. Require the Contractor, at its own expense, to hire an independent private-sector inspector general to monitor its activities, institute procedures and conduct internal inquiries, in a manner prescribed by the Owner.

    3. Increase retainage to an amount not to exceed ten percent (10%).

    4. Take any other remedial action deemed appropriate.

Section 17.05 - Anti-Riot Provisions

A. The Contractor agrees that no part of the Contract funds shall be used to make payments, give assistance, or supply services, in any form, to any individual convicted in any federal, state, or local court of competent jurisdiction for inciting, promoting, or carrying on a riot, or engaging in any group activity resulting in material damage to property or injury to persons found to be in violation of federal, state or local laws designed to protect persons or property.

B. The Contractor and each Subcontractor shall notify their employees of all rules and regulations adopted pursuant to Article 129-A of the NYS Education Law. The Contractor shall post notices containing the text of the aforementioned rules and regulations at the Site.

Section 17.06 - Ethical Conduct

A. Officers and employees of the Owner are bound by Sections 73, 73-a and 74 of the NYS Public Officers Law. In addition, no officer, employee, architect, attorney, engineer, inspector, or consultant of or for the Owner authorized on behalf of the Owner to exercise any legislative, executive, administrative, supervisory, or other similar functions in connection with the Contract or the Work, shall become personally interested, directly or indirectly, in the Contract, material supply contract, subcontract, insurance contract, or any other contract pertaining to the Work.

B. Section 73(5) of the NYS Public Officers Law expressly prohibits the Contractor, or its agents, from directly or indirectly offering or giving any gift having more than nominal value to an employee of the Owner under circumstances in which it could be reasonably inferred the gift was intended to influence the employee in the performance of their official duties or was intended as a reward for the employee's official action.

    1. In addition to the prohibition of Section 73(5) of the NYS Public Officers Law, the Dormitory Authority has a "zero tolerance" policy with respect to the solicitation, acceptance, or receipt of gifts from disqualified sources. Therefore, the Contractor and its agents shall refrain from offering or giving anything of value to an employee of the Owner. Employees of the Owner may not solicit any gift, gratuity, stipend, or thing of value from the Contractor or its agents. Violations of these gift provisions may be grounds for immediate Contract termination and/or referral for civil action or criminal prosecution.

C. To promote a working relationship with the Owner based on ethical business practices, the Contractor is expected to:

1. Furnish all goods, materials and services to the Owner as contractually required and specified.

2. Submit complete and accurate reports to the Owner and its representatives as required.

3. Not seek, solicit, demand or accept any information, verbal or written, from the Owner or its representatives that provides an unfair advantage over a competitor.

4. Not engage in any activity or course of conduct that restricts open and fair competition on Owner-related projects and transactions.

5. Not engage in any course of conduct with Owner employees or its representatives that constitutes a conflict of interest, in fact or in appearance.

6. Not offer or give any unlawful gifts or gratuities, or engage in bribery or other criminal activity.

D. The Owner encourages the Contractor to advance and support ethical business conduct and practices among its directors, officers, and employees, preferably through the adoption of corporate ethics awareness training programs and written codes of conduct.

E. Although the Contractor may employ relatives of Owner employees, the Owner shall be made aware of such circumstances as soon as possible, preferably in writing, to ensure a conflict of interest situation does not arise. The Owner reserves the right to request that the Contractor modify the work assignment of a relative of an Owner employee where a conflict of interest, or the appearance thereof, is deemed to exist.

F. The Contractor may hire former employees of the Owner. However, as a general rule, former employees of the Owner may neither appear nor practice before the Owner, nor receive compensation for services rendered on a matter before the Owner, for a period of two years following their separation from service with the Owner. In addition, former employees of the Owner are subject to a "lifetime bar" from appearing before the Owner or receiving compensation for services regarding any transaction in which they personally participated or which was under their active consideration during their tenure with the Owner.

G. The Contractor agrees to notify the Owner's Office of Internal Affairs at 518-257-3193 of any activity by an employee of the Owner that is inconsistent with the contents of this General Conditions Section 17.06.

H. Any violation of this General Conditions Section 17.06 shall justify termination of this Contract and may result in Owner's rejection of the Contractor's bids or proposals for future agreements.

Section 17.07 – Continuing Integrity

A. Contractor shall at all times during the Contract term remain responsible. Contractor agrees, if requested by the President of Owner or his or her designee, to present evidence of its continuing legal authority to do business in New York State, integrity, experience, ability, prior performance, and organizational and financial capacity.

B. The President of Owner or his or her designee, in his or her sole discretion, reserves the right to suspend any or all activities under this Contract, at any time, when he or she discovers information that calls in to question the responsibility of Contractor. In the event of such suspension, Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, Contractor shall comply with the terms of the suspension order. Contract activity may resume at such time as the President of Owner or his or her designee issues a written notice authorizing a resumption of performance under the Contract.

C. Notwithstanding any other provision of this Contract, upon written notice to Contractor, and a reasonable opportunity to be heard with the appropriate Owner officials or staff, the Contract may be terminated by the President of Owner or his or her designee at Contractor's expense where Contractor is determined by the President of Owner or his or her designee to be non-responsible. In such event, the President of Owner or his or her designee may complete the contractual requirements in any manner he or she may deem advisable and pursue available legal or equitable remedies for the breach.

Section 17.08 – Iran Divestment

A. By entering in to this Contract, Contractor certifies, under the penalties of perjury, that Contractor is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the NYS State Finance Law. Contractor further certifies that Contractor will not utilize on this Contract any subcontractor that is identified on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the NYS State Finance Law.

B. During this Contract, should Owner receive information that a person (as defined in NYS State Finance Law §165-a) is in violation of the above-referenced certifications, Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

ARTICLE 18 -- 2005 PROCUREMENT LOBBYING LAW

Section 18.01 - Procurement Lobbying Law

Bidders shall affirm their understanding of and agree to comply with NYS State Finance Law § 139-j (3) and § 139-j (6) (b), certify their compliance with NYS State Finance Law § 139-k (5), disclose prior non-responsibility determinations under NYS State Finance Law § 139-j, and shall certify that the information they provide with respect to NYS State Finance Law § 139-j and § 139-k is complete, true, and accurate. Contractor hereby reaffirms its understanding of an agreement to comply with NYS State Finance Law § 139-j (3) and § 139-j (6) (b), re-certifies its compliance with NYS State Finance Law § 139-k (5) and recertifies that the information it provided with respect to NYS State Finance Law § 139-j and § 139-k is complete, true, and accurate.

Section 18.02 - Contractor's Certifications

For any contract $15,000 or more each Contractor shall submit, with its bid, on the form provided herewith, the *2005 Procurement Lobbying Law – Certification,* pursuant to NYS State Finance Law § 139-j and § 139-k. The information contained in the *2005 Procurement Lobbying Law – Certification,* pursuant to NYS State Finance Law § 139-j and § 139-k will serve as an informational resource to aid the Owner in making an award determination.

Section 18.03 - Termination Provisions

The Owner reserves the right to terminate this Contract in the event it is found that the certification filed by the Contractor in accordance with NYS State Finance Law § 139-j and § 139-k, as such may be amended or modified, was intentionally false or intentionally incomplete. Upon such finding, the Owner may exercise its right pursuant to General Conditions Section 11.01 – Termination for Cause.

ARTICLE 19 -- EXECUTIVE ORDER No. 125

Section 19.01 - Determination of Contractor Responsibility

In order to assist the Owner in determining the responsibility and reliability of the lowest bidder for the Contract and to effectuate the directives of Executive Order No. 125, dated May 22, 1989, (9 NYCRR §4.125) the Council of Contracting Agencies has adopted procedures to collect and exchange relevant information among contracting agencies.

Section 19.02 – NYS Vendor Responsibility Questionnaire

A. For any Contract valued at $10,000 or more, the NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) for the Contractor or for any Subcontractor shall be submitted as requested by the Owner. Owner may request an updated NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) for the Contractor or for any Subcontractor as often as the Owner, in its sole and exclusive discretion, deems necessary to carry out the Owner's duties and responsibilities under this Contract.

B. The information contained in the NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) will serve as an informational resource to aid the Owner in making an award determination and in making other determinations for this Contract.

ARTICLE 20 -- OPPORTUNITY PROGRAMS

Section 20.01 - General Provisions

A. The Dormitory Authority is required to implement the provisions of NYS Executive Law Article 15-A and Parts 140 through 145 of Title 5 of the NYCRR for all State contracts (as defined in such statute and regulations) with a value:

   1. in excess of $25,000 for labor, services, equipment, materials, or any combination of the foregoing; or

   2. in excess of $100,000 for real property renovations and construction.

B. The Contractor agrees, in addition to any other nondiscrimination provision of the Contract and at no additional cost to the Owner, to fully comply and cooperate with the Owner in the implementation of NYS Executive Law ARTICLE 15-A, PARTICIPATION BY MINORITY GROUP MEMBERS AND WOMEN WITH RESPECT TO STATE CONTRACTS, and the regulations promulgated thereunder. These requirements include: equal employment opportunities for minority group members and women (EEO), and contracting opportunities for NYS certified minority and women-owned business

enterprises (MWBEs). The Contractor's demonstration of good faith efforts pursuant to 5 NYCRR § 142.8 shall be a part of these requirements. These provisions shall be deemed supplementary to, and not in lieu of the nondiscrimination provisions required by NYS Executive Law Article 15 (the Human Rights Law) and other applicable federal, state and local laws.

C. Failure to comply with all requirements in this General Conditions Article 20 may result in a finding of non-responsiveness, non-responsibility, breach of contract or any combination of the foregoing leading to the assessment of liquidated damages pursuant to General Conditions Section 20.06 and other remedies available to the Owner pursuant to the Contract and applicable law.

Section 20.02 – Equal Employment Opportunity (EEO)

A. The provisions of NYS Executive Law Article 15-A, and the rules and regulations promulgated thereunder pertaining to equal employment opportunities for minority group members and women shall apply to the Contract.

B. The Contractor shall:

1. Undertake or continue, and ensure each Subcontractor shall undertake or continue, existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability, or marital status. For these purposes, EEO shall apply in the areas of recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation.

2. Submit an EEO policy statement to the Owner within seventy-two (72) hours after the date of the Letter of Intent to award the Contract.

3. Adopt a model EEO policy statement and require each Subcontractor to adopt a model EEO policy statement if the Contractor or Subcontractor does not have an existing EEO policy statement, and if the Owner requires the Contractor or Subcontractor to adopt a model EEO policy statement.

4. Have a Contractor's EEO policy statement that shall include the following language:

   a. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability, or marital status, will undertake or continue existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination, and shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force.

   b. The Contractor shall state in all solicitations or advertisements for employees that, in the performance of the Contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability, or marital status.

   c. The Contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union, or representative will not discriminate on the basis of race, creed, color, national origin, sex age,

disability or marital status and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations herein.

5. The Contractor shall include the provisions of paragraphs a. through c. of this General Conditions Section 20.02 B. 4. and Subdivision E of this General Conditions Section 20.02, which provides for relevant provisions of the Human Rights Law, in every Subcontract in such a manner that the requirements of these provisions will be binding upon each Subcontractor as to Work in connection with the Contract.

C. To ensure compliance with this General Conditions Section 20.02, the Contractor shall submit a staffing plan, on a form provided by Owner, to document the composition of the proposed workforce to be utilized in the performance of the Contract by the specified categories listed, including ethnic background, gender, and Federal occupational categories. The Contractor shall complete the staffing plan form and submit it when directed by Owner.

D. To ensure continuous compliance with General Conditions Section 20.02:

1. The Contractor shall submit a Workforce Utilization Report, and shall require each Subcontractor to submit a Workforce Utilization Report, in such form as shall be required by the Owner on a monthly basis during the term of the Contract.

2. Separate forms shall be completed by the Contractor and each Subcontractor.

3. Pursuant to Executive Order 162 (9 NYCRR 8.162) dated January 9, 2017, the Contractor and each Subcontractor are also required to report the gross wages paid to each of their employees for the Work performed by such employees on the Contract on a monthly basis.

E. The Contractor shall comply with the provisions of the NYS Human Rights Law, and all other State and Federal statutory and constitutional non-discrimination provisions. The Contractor and each Subcontractor shall not discriminate against any employee or applicant for employment because of race, creed (religion), color, sex, national origin, sexual orientation, military status, age, disability, predisposing genetic characteristic, marital status, or domestic violence victim status, and shall also follow the requirements of the NYS Human Rights Law with regard to non-discrimination on the basis of prior criminal conviction and prior arrest.

Section 20.03 – Opportunities for Minority and Women-Owned Business Enterprises (MWBE)

A. The Owner has established goals for the participation in this Contract of NYS certified minority-owned business enterprises (“MBE”) and NYS certified women-owned business enterprises (“WBE” and collectively with MBEs, “MWBE”). The goals (collectively, MWBE Contract Goals) are set forth in the Information for Bidders Section 8.0 – Opportunity Programs Requirements.

B. The Contractor represents and warrants that, as a condition for award of the Contract, the Contractor has submitted a Statewide Utilization Management Plan (“SUMP”) via the NYS Contract System (NYSCS) which lists all proposed Subcontractors including an identification of the NYS certified MWBE subcontractors and suppliers the Contractor intends to use to perform the Work of the Contract and to achieve the MWBE Contract Goals established in the Contract Documents. In addition, or alternatively, Contractor may have submitted a request for a waiver. Prior to award of the Contract, the Owner approved Contractor’s plan to achieve the MWBE Contract Goals established in the Contract Documents (MWBE Utilization Plan) to the extent the Owner did not approve Contractor’s request for

a waiver of part or all of the MWBE Contract Goals. Owner approval of the MWBE Utilization Plan approves a Subcontractor only for the purpose of the MWBE Utilization Plan.

C. Contractor agrees to adhere to the MWBE Utilization Plan in the performance of the Contract. Contractor shall not change the Utilization Plan without the prior written approval of the Owner. Contractor further agrees that failure to adhere to the MWBE Utilization Plan shall constitute a material breach of the Contract and upon such breach, the Owner shall be entitled to any remedy provided in the Contract or by law, including but not limited to a finding that the Contractor is non-responsible.

D. The Contractor understands that only sums paid to MWBEs for the performance of a commercially useful function, as that term is defined in 5 NYCRR § 140.1 may be applied towards the achievement of the applicable MWBE Contract Goal. The portion of a subcontract with an MWBE serving as a supplier that shall be deemed to represent the commercially useful function performed by the MWBE shall be 60% of the total value of the subcontract. The portion of a subcontract with an MWBE serving as a broker that shall be deemed to represent the commercially useful function performed by the MWBE shall be the monetary value for fees, or the markup percentage, charged by the MWBE. The Owner will audit the Contractor's efforts to achieve the MWBE Contract Goals through the NYSCS.

Section 20.04 - Good Faith Efforts

A. The Contractor shall document good faith efforts pursuant to 5 NYCRR § 142.5 to provide meaningful participation by MWBEs as Subcontractors (which includes material suppliers, other vendors, and others; see definition of Subcontractor in General Conditions Article 1 - Definitions) in the performance of the Contract, to comply with the requirements of the Contract and to enable the Owner to determine compliance with the provisions of this General Conditions Article 20. Guidelines for documentation of good faith efforts are at http://www.dasny.org/tools-forms/forms under MWSBE.

B. If the Contractor fails to adequately document good faith efforts, it may result in a finding of non-compliance.

Section 20.05 - Waivers

A. If the Contractor, after making good faith efforts satisfactory to the Owner, is unable to achieve the MWBE Contract Goals, the Contractor may submit a request for a waiver through the NYSCS, or a non-electronic method provided by the Owner. The request for a waiver must be supported by evidence of the good faith efforts by the Contractor to achieve the maximum feasible MWBE participation towards the applicable MWBE Contract Goals. If the documentation included with the waiver request is complete, the Owner shall evaluate the request and issue a written notice of acceptance or denial within twenty (20) business days of receipt.

B. If the Owner, upon review of the SUMP, the MWBE Utilization Plan, the NYSCS and any other relevant information, determines that the Contractor is failing or refusing to comply with the MWBE Contract Goals and no waiver has been issued in regard to such non-compliance, the Owner may issue a notice of deficiency to the Contractor. The Contractor shall respond to the notice to deficiency within seven (7) business days of receipt. Such response may include a request for partial or total waiver of MWBE Contract Goals.

Section 20.06 – Damages - MWBE Participation

A. If the Owner determines that the Contractor is not in compliance with the requirements of this General Conditions Article 20 and the Contractor refuses to comply with the requirements of this General

Conditions Article 20, or if the Contractor is found to have willfully and intentionally failed to comply with the MWBE Contract Goals, then: (1) the Contractor shall be obligated to pay the Owner liquidated damages; or (2) the Contractor shall be obligated to pay the Owner other appropriate damages; or (3) the Owner shall receive one or more other appropriate remedies, unless the Owner elects to pursue its remedies under NYS Executive Law Section 316. If the Owner declines to pursue its remedies under NYS Executive Law Section 316, the Owner may elect to pursue one or more of liquidated damages, other appropriate damages, and one or more other appropriate remedies.

B. If the Owner decides to assess liquidated damages, the Contractor shall be obligated to pay to the Owner liquidated damages in an amount equal to the difference between all sums identified for payment to MWBEs if the Contractor had achieved the MWBE Contract Goals and all sums actually paid to MWBEs for performance of Work under the Contract. If such liquidated damages have not been withheld by the Owner, the Contractor shall pay such liquidated damages to the Owner within sixty (60) days after they are assessed. provided, however, that if the Contractor has filed a complaint with the Director of the Division of Minority and Women's Business Development pursuant to 5 NYCRR §142.2, liquidated damages shall be payable only in the event of a determination adverse to the Contractor following the complaint process. The liquidated damages are intended to compensate the Owner only for the Owner's damage if the Owner determines that the Contractor is not in compliance with the requirements of General Conditions Sections 20.03, 20.04 and 20.05 and the Contractor refuses to comply with the requirements of General Conditions Sections 20.03, 20.04 and 20.05, or if the Contractor is found to have willfully and intentionally failed to comply with the MWBE Contract Goals. In addition, the Contractor shall be liable to the Owner to the fullest extent permitted by law for:

1. whatever other appropriate damages the Owner may incur; or

2. any other appropriate remedy to which the Owner may be entitled as a result of the Contractor's refusal to comply with the requirements of this General Conditions Article 20 outside the requirements of General Conditions Sections 20.03, 20.04, 20.05 and the MWBE Contract Goals.

Other appropriate damages include, but are not limited to, the expenses for personnel, supplies and overhead incurred by the Owner to administer and enforce the requirements of this General Conditions Article 20 other than the requirements of General Conditions Sections 20.03, 20.04, 20.05 and the MWBE Contract Goals.

Section 20.07 – Reporting to Owner

The Contractor shall complete the reports and submit as indicated to establish and update EEO requirements during the life of the Contract. Reports not submitted at such time shall be cause for the Owner to delay payment to the Contractor. The listed reports are a requirement of the Contract and copies are included in the Contract Documents and template forms are also available on the Dormitory Authority's web site at, http://www.dasny.org/tools-forms/forms, under MWSBE.

ARTICLE 21- SERVICE-DISABLED VETERAN OWNED BUSINESSES

Section 21.01 – General Provisions

Article 17-B of the NYS Executive Law provides for more meaningful participation in public procurement by certified Service-Disabled Veteran – Owned Businesses (SDVOB), thereby further integrating such businesses in to New York State's economy. The Dormitory Authority recognizes the need to promote the employment of service-disabled veterans and to ensure that certified SDVOBs have opportunities for maximum feasible participation in the performance of Dormitory Authority contracts.

Section 21.02 – Contract with Goals

A. If the Information for Bidders established an overall goal for SDVOB participation in this Contract and Contractor submitted an SDVOB Utilization Plan that was accepted by the Dormitory Authority, Contractor shall follow the accepted SDVOB Utilization Plan. Contractor, by award of the Contract, certified that Contractor shall follow the submitted and accepted SDVOB Utilization Plan for the performance of SDVOBs on the Contract.

B. Contractor shall not change the accepted SDVOB Utilization Plan without the prior written consent of the Dormitory Authority. Any modifications or changes to the accepted SDVOB Utilization Plan after award of the Contract to the Contractor shall be reported to the Dormitory Authority on a revised SDVOB Utilization Plan. As part of a revised SDVOB Utilization Plan, the Contractor may request a partial or total waiver of the goal for SDVOB participation but such request must be made prior to submission of the Application for Payment for the final payment on the Contract. Contractor shall make and shall document good faith efforts to provide meaningful participation by SDVOBs as subcontractors or suppliers in the performance of the Contract. The revised SDVOB Utilization Plan is not effective unless and until it is accepted by the Dormitory Authority. If the revised SDVOB Utilization Plan is not accepted by the Dormitory Authority, the Dormitory Authority shall issue a notice of deficiency and the Contractor shall proceed as set forth in paragraph D of this General Conditions Section 21.02

C. Contractor shall report to the Dormitory Authority Monthly SDVOB Contractor Compliance during the Contract documenting the preceding month's progress towards implementing the accepted SDVOB Utilization Plan and achieving the SDVOB goals for the Contract. This information shall be submitted to the Dormitory Authority in the manner and at the times directed by the Dormitory Authority.

D. If the Dormitory Authority, upon review of the SDVOB Utilization Plan and the Monthly SDVOB Contractor Compliance reports determines that the Contractor is failing or refusing to comply with the Contract SDVOB goals and no waiver has been issued with respect to such non-compliance, the Dormitory Authority may issue a notice of deficiency to the Contractor. The Contractor shall respond to the notice of deficiency within seven (7) business days of receipt. Such response may include a request for partial or total waiver of the Contract SDVOB goals.

E. Contractor shall make and shall document its good faith efforts to utilize SDVOBs in the performance of the Contract. Evidence of required good faith efforts includes but is not limited to:

1. Copies of solicitations to SDVOBs and any responses thereto;

2. Explanation of the specific reason(s) each SDVOB responding to a Contractor's solicitation was not selected;

3. Dates of any pre-bid, pre-award or other meetings attended by Contractor, if any, scheduled by the Dormitory Authority with certified SDVOBs which the Dormitory Authority determined were capable of fulfilling the SDVOB goals in the Contract;

4. Information describing the specific steps undertaken to reasonably structure the scope of subcontracts and material orders for the purpose of subcontracting with, or obtaining materials from, SDVOBs;

5. Other information relevant to the waiver request.

F. Contractor's failure to use SDVOBs in accordance with the accepted SDVOB Utilization Plan or any accepted revised SDVOB Utilization Plan shall be a material breach of the Contract and upon such breach, the Dormitory Authority shall be entitled to any remedy provided in the Contract, by law or regulation or at law or in equity, including but not limited to a finding the Contractor is non-responsible. If the Dormitory Authority finds the Contractor willfully and intentionally fails to comply with the Contract SDVOB goals, the Contractor shall pay damages to the Dormitory Authority as set forth in 9 NYCRR § 252.2(s).

Section 21.03 – Contract with No Goals

If the Information for Bidders does not establish an overall goal for SDVOB participation in this Contract, Contractors are still strongly encouraged and expected to consider SDVOBs in the fulfillment of the requirements of the Contract in recognition of the service and sacrifices made by service-disabled veterans and in recognition of their economic activity in doing business in New York State. The Contractor is encouraged to make good faith efforts to promote and assist in the participation of SDVOBs in performance of the Contract as Subcontractors.

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DORMITORY AUTHORITY STATE OF NEW YORK

CONSTRUCTION GENERAL REQUIREMENTS

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SECTION 011200 - CONTRACT SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a summary of each contract for the Project, including responsibilities for coordination and temporary facilities and controls.

B. Specific requirements for the work of each contract are also indicated in individual Specification Sections and on Drawings for each contract.

C. Related Sections:
1. Information to Bidders
2. Section 013100 - Project Management and Coordination.
3. Section 013200 - Construction Progress Documentation.
4. Section 015000 - Temporary Facilities and Controls.

1.3 CONTRACT TIME AND USE OF PREMISES

A. Time is of the essence. Work shall commence May 23, 2019 and shall progress to substantial completion identified in Section 16 of the Information to bidders.
1. The contractor is required to progress the work to meet the Bid Milestone Schedule included as an appendix to Specification Section 013200 - Construction Progress Documentation.
2. The Contractor is required to provide a minimum of two shifts through abatement and demolition activities to complete the work and met the associated Bid Milestone.
3. The Contractor should anticipate that multiple shifts or multiple crews may be required during other project work to complete the work on schedule and achieve Bid Milestone Schedule and Substantial Completion.
4. The Substantial Completion date shall not be changed for additional work or unforeseeable conditions. Additional shifts or work crews will be required to mitigate schedule implications of changes to maintain the Bid Milestone Schedule and Substantial Completion.

B. Contractor Use of Premise
1. The Contractor shall have full access to the project site.
2. Construction activity is permitted to occur 24 hours a day seven dates a week for the duration of the construction period. Specific limitations are identified in Specification Section 015000 - Temporary Facilities and Controls.

1.4 CONTRACTOR'S PROJECT MANAGER

A. Contractor and each Sub-contractor shall identify a project manager who shall be responsible for coordination between and among each and all contractors and subcontractors for the Project and the Owner. The contractor's project manager shall work on site during the week.

B. Project Scheduler: The Contractor shall provide a project scheduler to coordinate the scheduling activities of the Contract, to prepare an overall CPM schedule, and to monitor and update the CPM schedule periodically.

1.5 COORDINATION ACTIVITIES

A. Coordination activities of Contractor's project manager include, but are not limited to, the following:

1. Provide overall coordination of the Work.
2. Coordinate use of access and workspaces shared with other contractors.
3. Coordinate product selections for compatibility with other products selected under this Contract.
4. Provide overall coordination of temporary facilities and controls.
5. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
6. Coordinate construction and operations of the Work with work performed by the Owner's construction forces.
7. Prepare Coordinated Composite Drawings, in collaboration with all trades to coordinate the work for the Project.
8. Coordinate sequencing and scheduling of the Work. Include the following:
   a. Include all submittals, lead time, and construction duration in the Project Schedule to validate and manage the sequence of Work. Include duration of time required for submittals, with allowance of additional time for resubmittals. Confirm and include lead time for materials, prior to Construction Baseline Schedule submission.
   b. Include all required inspections performed by the Owner, testing, punch list inspection, Work remediation, Final Cleaning, and closeout in Project Schedule.
   c. Initial Coordination Meeting: At earliest possible date, the Owner will arrange and conduct a meeting with the contractors for the Project for sequencing and coordinating the work of the Project.
9. Provide quality assurance and quality control services specified in Section 014000 – Quality and Code Requirements.
10. Coordinate sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections.
11. Provide information necessary to adjust, move, or relocate existing utility structures affected by construction.
12. Provide progress cleaning of all Contract work areas and coordinate progress cleaning of areas or pieces of equipment.
13. Coordinate cutting and patching.
14. Coordinate protection of the Work.
15. Coordinate firestopping.
16. Coordinate completion of punch list items.

17. Coordinate preparation of As-built drawings and specifications.
18. Print and submit all required project turnover documents.
19. Coordinate preparation of operation and maintenance manuals.

B. Responsibilities of project manager for construction contract includes coordination for temporary facilities and controls, include, but are not limited to, the following:

1. Provide a field office for use by Contractor.
2. Provide telephone service for Contractor.

1.6 GENERAL REQUIREMENTS OF CONTRACTS

A. Extent of Contract: Requirements indicated on drawings and in specification sections determine which Division includes a specific element of the Work of the Contract.

1. The work described in this section shall be complete systems and assemblies, including products, components, accessories, and installation required by the respective contract documents.
2. Trenches and all excavation shall be the Work of the General Contractor.
3. Blocking, backing panels, sleeves, and metal fabrication supports for the work shall be provided by the respective contract documents.
4. Furnishing of access panels for the work of all trades shall be the work of the General Contractor. Installation of access panels located in the substrate of ceilings, walls and floors shall be the Work of the General Contract.
5. Equipment pads shall be the work of the General Contractor.
6. Roof-mounted equipment curbs shall be the Work of the General Contractor.
7. Cutting and Patching: Each contract shall perform its own cutting and patching.
8. Firestopping for the work of each division shall be provided by Division 7.
9. Contractors' Preliminary CPM Schedule: Within seven working days after preliminary CPM schedule submittal has been received from the scheduling consultant, submit a matching schedule showing construction operations sequenced and coordinated with overall construction.

B. Substitutions: The General Contractor's project manager shall coordinate approved substitutions with remainder of the work of the Project.

C. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Section 015000 - Temporary Facilities and Controls, the Contractors are responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility necessary for its own normal construction activity, and costs and use charges associated with each facility, except as otherwise provided for in this Section 011200.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own field office complete with necessary furniture, utilities, and telephone service.
4. Its own storage and fabrication sheds.
5. Temporary enclosures for construction activities.
6. Staging and scaffolding for construction activities.
7. General hoisting facilities for construction activities.

8. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.
9. Progress cleaning of work areas affected by its operations on a daily basis.
10. Secure lockup of its own tools, materials, and equipment.
11. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

1.7 GENERAL CONSTRUCTION CONTRACT WORK

A. The general scope of work consists of the renovation of an existing four story Residence Hall and the addition of a fifth story to the building. Deyo Hall is an existing building with a concrete structural system, brick veneer exterior, and copper mansard and membrane roofing system. The building will be completely renovated. A new steel-framed fifth story will be added to the building. A new steel-framed, sloped metal roof and attic will added on top of the fifth story. An entrance vestibule additions will be constructed. New mechanical, electrical, plumbing, and fire protection will be provided along with all new interior finishes. Site work will be completed in support of the renovation and additions.

B. Work in the General Construction Contract includes, but is not limited to, the following:
1. Asbestos abatement as defined in this project manual and on the contract drawings is a part of the Work.
2. Site improvements, including roadways, parking lots, pedestrian paving, site development furnishings and equipment, and landscaping, as well as complete site restoration prior to Final Acceptance.
3. Site water supply and distribution.
4. Site sanitary sewerage.
5. Site storm drainage.
6. Selective demolition.
7. Foundations, including footings and foundation walls.
8. Slabs-on-grade, including earthwork, sub-drainage systems, and insulation.
9. Below-grade building construction, including excavation, backfill, and thermal and moisture protection.
10. Superstructure, including floor and roof construction.
11. Exterior enclosure, including roofs, walls, doors, windows and louvers.
12. Roofing, including coverings and flashings.
13. Interior construction, including partitions, doors, interior glazed openings, and fittings.
14. Fire-protection specialties.
15. Stairs, including structure, railings and finishes.
16. Interior finishes, finish carpentry, architectural woodwork, and built-in casework.
17. Conveying systems, including elevators and a wheelchair lift.
18. Equipment, including the following:
    a. Residential appliances.
19. Furnishings, including floor mats.
20. Plumbing demolition.
21. Plumbing fixtures.
22. Domestic water distribution.
23. Sanitary waste.
24. Storm water drainage.
25. Fire protection systems.

26. Plumbing connections to equipment furnished by all other trades.
27. Energy supply, including hot-water supply systems.
28. HVAC systems and equipment.
29. HVAC instrumentation and controls.
30. HVAC testing, adjusting, and balancing.
31. Building automation system.
32. Mechanical connections to equipment furnished by all other trades.
33. Electrical service and distribution.
34. Exterior and interior lighting.
35. Communication and security.
36. Fire alarm and detection systems.
37. Electrical connections to equipment furnished by all other trades.

C. Temporary facilities and controls in the General Construction Contract include, but are not limited to, the following:

1. The nearby sewage pump building, site lighting, and site gate that are fed from the basement of Deyo Hall shall remain fully operational throughout the duration of the contract. The contractor shall coordinate the work to maintain its operation.

2. Temporary facilities and controls that are not otherwise specifically assigned to other contracts.
3. Sediment and erosion control.
4. Stormwater control.
5. Unpiped temporary toilet fixtures, wash facilities, and drinking water facilities, including disposable supplies.
6. Temporary enclosure for building exterior.
7. Dewatering facilities and drains.
8. Excavation support and protection for the Work of the contract.
9. Project identification and temporary signs.
10. General waste disposal facilities.
11. Pest control.
12. Temporary stairs.
13. Temporary fire-protection facilities.
14. Barricades, warning signs, and lights.
15. Site enclosure fence, to match campus standard blue and orange coated fence.
16. Covered walkways.
17. Security enclosure and lockup.
18. Environmental protection.
19. Restoration of Owner's existing facilities that are used as temporary facilities.
20. Temporary heating, cooling, and ventilation of building for duration of work.
21. Temporary water service.
22. Plumbing connections to existing systems and temporary facilities and controls furnished by other trades.
23. Temporary Electric power service and distribution.
24. Temporary Lighting.
25. Temporary Fire alarm and detection systems.
26. Electrical connections to existing systems and temporary facilities and controls furnished by other contracts.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 011200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Documents that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Contract.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other Work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. **Alternate No. 1: ADD – Linoleum tile in suite lounges in place of vinyl tile**.
1. Add the linoleum tile in the suite lounges, RD apartment, and basement corridor in place of vinyl composition tile as on the finish schedule on A400 and finish plans on A800 – A804.

A. **Alternate No. 2: ADD – Air Conditioning of Data Rooms**
1. Add the air conditioning of the Data Rooms as shown on M-Series drawings and associated work to support the equipment noted on the S and A drawings.

B. **Alternate No. 3: ADD – Linoleum tile in bedrooms in place of vinyl tile**.
1. Add the linoleum tile in the bedrooms in place of vinyl composition tile as on the finish schedule on A400 and finish plans on A800 – A804.

C. **Alternate No. 4: ADD – Molded Stone on Walls**
1. Add the molded stone panels in the basement and first floor lobby as shown the A600s and on the finish schedule on A400.

END OF SECTION 012300

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, Schedule of Values, Contractor Pencil Copy and Application for Payment, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:

1. General Conditions, Article 8 - Payment, for requirements governing provisions for payment.
2. General Conditions, Article 20 – Opportunity Programs, for requirements governing minority participation.
3. Section 012300 – Alternates
4. Section 017700 – Contract Closeout Requirements, for administrative contract closeout requirements.
5. Section 018113 – Sustainable Design Requirements, for administrative requirements governing submittal of cost breakdown information required for LEED documentation, if applicable.

1.3 DEFINITIONS

A. Schedule of Values: A form in the Contract Documents, which establishes minimum level of payment detail to formulate an initial Application for Payment.

B. Contractor's Pencil Copy: A form provided by the Owner, which estimates a billing request from the Contractor. When approved by the Owner, formulates the Application for Payment.

C. Application for Payment: A form provided by the Owner, which provides certification by the Contractor for payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with the Owner.

B. The Contractor shall allocate portions of the Contract Sum to labor, material and major equipment costs to various portions of the Work as indicated on the form.

1. Submit the Schedule of Values to the Owner, for approval at earliest possible date after award of the Contract.
2. The Owner shall not approve any billing request until the Schedule of Values is approved.

C. Format and Content: Use model form provided in Contract Documents as a guide to establish line items for the Schedule of Values.

1. Arrange the Schedule of Values with separate columns to indicate the following for each item listed:

a. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

1) Labor.
2) Materials.
3) Major Equipment.

2. Provide a breakdown of Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.

a. Include separate line items under Contractor and principal subcontracts for LEED documentation, if applicable and other project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
4. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item, except Lump Sum and Quantity of Work Allowances.
5. Schedule of Values Updating: The Owner may require the Contractor to revise its Schedule of Values. Further, the Owner reserves the right to accept only those cost distributions which, in the Owner's opinion, are reasonable, equitably balanced and correspond to estimated quantities in Contract Documents.

1.5 MONTHLY APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as approved by the Owner and paid for by the Owner.

1. Initial Application for Payment, the Owner shall not approve any billing request until the Schedule of Values and Construction Schedule is approved.
2. Payment for allowance items and stored materials involve additional requirements.
3. Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Billing request may be submitted to the Owner once each month.

1. Submit Contractor's Pencil Copy billing request seven days prior to due date for review by the Owner.

C. Payment Forms: All forms and documents required for payment shall be provided by the Owner. Template forms and documents may also be available on the Dormitory Authority's web site www.dasny.org.

D. Preliminary Procedure: The Contractor may request from the Owner a Contractor's Pencil Copy form. Where indicated on the form, the Contractor shall enter a billing request, either dollar amount or percentage complete for each item number requesting payment.

1. If applicable, the Contractor shall obtain from the Owner, an Allowance Notice to Proceed for Allowance items and an Agreement for Materials Stored Off-Site prior to billing.
2. Submit Contractor's Pencil Copy billing request to the Owner for approval.
3. The Contractor shall provide updated documentation to the Owner in accordance with General Conditions, Article 20 – Opportunity Programs.

E. Procedure: Upon the Owner's approval of the Contractor's Pencil Copy billing request, payment documents will be provided to the Contractor. The Contractor shall complete each document and submit two copies of all documents with original signature & notary where indicated on forms, the following:

1. Application for Payment.
2. Compliance Report.
3. Contractor and Subcontractor Certifications Form
4. Contractor's Certified Payroll Form.
5. Allowance Allocation Form, if applicable

F. Payroll Forms: The Contractor and all Sub-contractors to the Contractor shall submit original copies of the Contractor and Subcontractor Certifications Form and Contractor's Certified Payroll Form.

G. Transmittal: Sign and notarize where indicated on each document, submit two original copies to Owner.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about payment.

H. Stored Materials: The Owner will provide an Agreement for Materials Stored Off-Site and specific forms that the Contractor must complete and submit to the Owner, including but not limited to;

1. Include in the Contractor's Pencil Copy billing request amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed.
2. Differentiate between items stored on-site and items stored off-site.
3. Provide certificate of insurance, evidence of transfer of title to the Owner, and consent of surety to payment, for stored materials.
4. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
5. Provide summary documentation for stored materials indicating the following:

a. Materials previously stored and included in previous Applications for Payment.
b. Work completed for this Application utilizing previously stored materials.
c. Additional materials stored with this Application.
d. Total materials remaining stored, including materials with this Application.

I. Payment: Timely payment by the Owner to the Contractor is governed by Section 2880 of the Public Authorities Law.

J. Liens: Upon receipt of a lien, the Owner shall deduct a sum of one and one-half (1 ½) times the amount stated to be due in the notice of lien from the application for payment. Upon official receipt of discharge of lien, the Owner shall provide payment as stated above.

1.6 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Preliminary Procedure: After issuance of the executed Notice of Substantial Completion, submit a Contractor's Pencil Copy billing request showing 100 percent completion for portion of the Work claimed as complete at Substantial Completion.

1. Submit Contractor's Pencil Copy billing request to the Owner for approval.
2. The Contractor shall provide final documentation to the Owner in accordance with General Conditions, Article 20 – Opportunity Programs.

B. Reduction of Retainage: The Contractor may request a reduction of retainage upon Substantial Completion of the Work or when a phase of Work is accepted by the Owner.

1. The Contractor submits to the Owner a written request to have retainage reduced and provides a cost estimate and schedule to complete all remaining Work items indicated on the executed Notice of Substantial Completion.
2. The Owner shall deduct from the sum two times the value of remaining items of Work to be completed or corrected.
3. The Owner will provide the Contractor with General Release and Consent of Surety forms based on the amount of reduction. The Contractor shall complete each document and submit three copies of each document with original signature & notary where indicated on forms.
4. The Owner shall hold payment until receipt of completed General Release and Consent of Surety forms.

C. Procedures: Upon the Owner approval of Contractor's Pencil Copy billing request, payment documents will be provided to the Contractor. The Contractor shall complete each document and submit two copies of all documents with original signature & notary where indicated on forms, the following:

1. Application for Payment.
2. Compliance Report.
3. Contractor and Subcontractor Certifications Form
4. Contractor's Certified Payroll Form.

D. Payroll Forms: The Contractor and all Sub-contractors to the Contractor shall submit original copies of the Contractor and Subcontractor Certifications Form and Contractor's Certified Payroll Form.

E. Transmittal: Sign and notarize where indicated on each document, submit two original copies to Owner.

F. Payment: Timely payment by the Owner to the Contractor is governed by Section 2880 of the Public Authorities Law.

G. Liens: Upon receipt of a lien, the Owner shall deduct a sum of one and one-half (1 ½) times the amount stated to be due in the notice of lien from the application for payment. Upon official receipt of discharge of lien, the Owner shall provide payment as stated above.

1.7 FINAL APPLICATION FOR PAYMENT (same as contract closeout documents)

A. Contract Compliance: The Contractor shall comply with the Requirements of General Conditions, Section 10.08 – Limitations on Actions.

B. Preliminary Procedure: All Work and Extra Work of the Contract and all requirements of Section 017700 – Contract Closeout Requirements must be complete and approved prior to commencement of final Application for Payment.

1. The Contractor shall request and submit to the Owner a final Contractor's Pencil Copy that will formulate the final Application for Payment.
2. The Contractor shall provide outstanding documentation to the Owner in accordance with General Conditions, Article 20 – Opportunity Programs.

C. Procedures: Upon the Owner approval of Contractor's Pencil Copy billing request, final Application for Payment and Contract closeout documents will be provided to the Contractor. The Contractor shall complete each document and submit two copies of all documents with original signature & notary, where indicated on the forms, the following:

1. Final Application for Payment including remaining Retainage.
2. Final Compliance Report.
3. Contractor and Subcontractor Certifications Form
4. Contractor's Certified Payroll Form.
5. Release Form -- Final Payment to Contractor.
6. Consent of Surety -- Final Payment to Contractor, with power of attorney.

D. Payroll Forms: The Contractor and all Sub-contractors to the Contractor shall submit original copies of the Contractor and Subcontractor Certifications Form and Contractor's Certified Payroll Form.

E. Transmittal: Sign and notarize where indicated on each document, submit two original copies to the Owner.

F. Final Payment: Timely payment by the Owner to the Contractor is governed by Section 2880 of the Public Authorities Law.

G. Liens: Upon receipt of a lien, the Owner shall deduct a sum of one and one-half (1 ½) times the amount stated to be due in the notice of lien from the final application for payment. Upon official receipt of discharge of lien, the Owner shall provide final payment as stated above.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

Dormitory Authority -- State of New York
515 Broadway
Albany, NY 12207

Date: 5/22/2018

SCHEDULE OF VALUES

Project No: 341830
Project: Deyo Hall Rehabilitation & Upper Floor Addition & Asoociated Asbestos Abatement, SUNY New Paltz
Contractor:

Contract No: 1
CR No:
Trade:

CSI	DESCRIPTION	UM	QTY	Labor	Material	SCHEDULED VALUE
010000	General Requirements	LS				$ -
	Bonding	LS				$ -
	Insurances	LS				$ -
	Supervision 1	Months				$ -
	Supervision 2	Months				$ -
	Scheduling/Coordination	LS				$ -
	Final Cleanup	LS				$ -
	Project Closeout	LS				$ -
013300	Submittal Procedures	LS				$ -
014599	Concrete In-Situ Relative Humidity and PH Testing	LS				$ -
015000	Temporary Facilities and Controls	LS				$ -
017823	Operation and Maintenance Manuals	LS				$ -
017839	As-Builts	LS				$ -
018113	Sustainable Design Requirements	LS				$ -
019113	Commissioning	CY				$ -
024119	Selective Demolition & Removal	SF				$ -
028200	Asbestos Remediation	SF				$ -
028400	Non Liquid PCB Material Removal	SF				$ -
028600	Identification and Disposal of Hazardous Waste	LS				
028700	Removal and Disposal of Universal Waste and Fluorescent Lamps	LS				
030132	Fiber Reinforced Polymer	LS				$ -
033000	Cast in Place Concrete	CY				$ -
035416	Concrete Floor Underlayment	CY				$ -
040120	Masonry Restoration Cleaning	SF				$ -
040122	Masonry Restoration	SF				$ -
042000	Unit Masonry	SF				$ -
051200	Structural Steel Framing	TON				$ -
051213	Arch Exposed Structural Steel Framing	TON				$ -
052100	Steel Joist Framing	LS				$ -
053100	Steel Decking	SF				$ -
054000	Cold Formed Metal Framing	SF				$ -
054400	Cold Formed Metal Trusses	LS				$ -
055000	Metal Fabrications	TON				$ -
057300	Prefabricated Glass Railing System	SF				$ -
061000	Rough Carpentry	LF				$ -
061643	Noncombustible Sheathing	SF				$ -
062023	Interior Finish Carpentry	LS				
064000	Architectural Woodwork	LF				$ -
064100	Molded Stone Panels	SF				$ -
066116	Solid Surface Fabrications	SF				$ -
072100	Thermal Insulation	SF				$ -
072210	Indoor Air Quality Testing Requirements	LS				$ -
072400	Synthetic Stucco System	SF				$ -
074113	Metal Roof Panels	SF				$ -
074200	Composite Stone Panels	LS				
075423	TPO Roofing	SF				$ -
076200	Sheet Metal Flashing & Trim	LF				$ -
077200	Roof Accessories	LF				$ -
078210	Intumescent Fire Resistant Material	LS				
078400	Fire Stopping	LF				$ -
079200	Joint Sealants	LF				$ -
081113	Hollow Metal Doors and Frames	EA				$ -
081416	Flush Wood Doors	EA				$ -
083113	Access Doors and Frames	LS				$ -
083500	Side Folding Doors	LS				$ -
084113	Aluminum Framed Entrances and Storefronts	SF				$ -
085113	Aluminum Windows	EA				$ -
087100	Door Hardware	EA				$ -
088000	Glazing	LS				$ -
088860	Fire Protection Systems	SF				$ -
089100	Metal Louver Gate	LS				$ -
092100	Gypsum Drywall	SF				$ -
095100	Acoustical Ceilings	SF				$ -
095400	Specialty Ceilings	SF				$ -

CSI	DESCRIPTION	UM	QTY	Labor	Material	SCHEDULED VALUE
096500	Resilient Flooring	SF				$ -
096705	Epoxy Flooring	SF				$ -
096800	Carpeting	SF				$ -
098413	Fixed Sound Absorptive Panels	SF				$ -
099100	Painting	SF				$ -
101100	Visual Display Surfaces	EA				$ -
101139	Visual Display Rails	EA				$ -
101400	Signage and Directories	EA				$ -
102113	Toilet Compartments	SF				$ -
102213	Wire Mesh Partitions	LS				$ -
102610	Corner Guards	LF				$ -
102623	Fiber Reinforced Plastic Panels	LS				$ -
102813	Toilet Accessories	EA				$ -
104400	Fire Extinguishers & Cabinets	EA				$ -
105113	Metal Lockers	EA				$ -
105500	Postal Specialties	EA				$ -
113100	Residential Equipment	LS				$ -
122400	Window Shades	LS				
123530	Residential Casework	LS				$ -
124813	Floor Mats	SF				$ -
129300	Site Furnishings	LS				$ -
133300	Segmented Retaining Wall Systems	LS				
142100	Electric Traction Elevators	EA				$ -
144200	Wheelchair Lift	EA				$ -
210500	Common Work Results for Fire Suppression	SF				$ -
210517	Sleeves and Sleeve Seals for Fire Suppression Piping	LS				
210553	Identification for Fire Suppression Piping and Equipment	LS				$ -
211313	Fire Pump	LS				$ -
220100	General Provisions for Plumbing Work	LS				$ -
220523	Valves for Plumbing Work	LS				$ -
220529	Hangers and Supports for Plumbing Work	LS				$ -
220700	Insulation for Plumbing Work	LS				$ -
220800	Commissioning of Plumbing Systems	LS				$ -
221116	Pipe, Tube and Fittings for Plumbing Work	LS				$ -
221123	Pumping Equipment	LS				$ -
221124	Testing and Adjustments	LS				$ -
221319	Plumbing Equipment, Specialties and Accessories	LS				$ -
221320	Domestic Hot Water Heaters	LS				$ -
221330	Plumbing Fixtures and Trims	LS				$ -
224000	Approved Manufacturers for Plumbing Work	LS				$ -
230513	Common Motor Requirements for HVAC Equipment	LS				$ -
230519	Meters and Gages for HVAC Piping	LS				$ -
230553	Identification for HVAC Piping and Equipment	LS				$ -
230593	Testing, Adjusting and Balancing for HVAC	LS				$ -
230713	Duct Insulation	LS				$ -
230716	HVAC Equipment Insulation	LS				$ -
230719	HVAC Piping Insulation	LS				$ -
230800	Commissioning of HVAC Systems	LS				$ -
230924	Direct - Digital Control System for HVAC	LS				$ -
230993	Sequence of Operations for HVAC Controls	LS				$ -
232113	Hydronic Piping	LS				$ -
232114	Hydronic Specialties	LS				$ -
232116	High Temperature Hot Water Piping	LS				
232123	Hydronic Pumps	LS				$ -
233100	HVAC Ducts	LS				$ -
233300	Air Duct Accessories	LS				$ -
233413	Axial HVAC Fans	LS				$ -
233416	Centrifugal HVAC Fans	LS				$ -
233700	Air Outlets and Inlets	LS				$ -
235100	Flue Vents and Combistion Air Ducts	LS				
235700	Heat Exchangers for HVAC	LS				$ -
237201	Air-to-Air Energy Recovery Equipment	LS				$ -
237202	Small Air-to-Air Energy Recovery Equipment	LS				$ -
238101	Terminal Heat Transfer Units	LS				$ -
238127	Small Split-System Heating and Cooling	LS				$ -
238216	Air Coils	LS				$ -
240000	General Commissioning Requirements	LS				$ -
260501	Electrical Demolition	LS				$ -
260502	Removal of Fluorescent Light Ballasts/Capacitors and Fluorescent Light Tubes	LS				$ -
260503	Common Requirements for Electrical Work	LS				$ -
260505	Arc Flash Hazard Analysis/Short-Circuit/Coordination Study	LS				$ -
260513	Medium Voltage Cables	LS				$ -
260519	Low-Voltage Electrical Power Conductors and Cables (600V and Less)	LS				$ -
260526	Grounding and Bonding for Electrical Systems	LS				$ -
260529	Hangers and Supports for Electrical Systems	LS				$ -
260534	Conduit	LS				$ -
260535	Surface Raceways	LS				$ -

CSI	DESCRIPTION	UM	QTY	Labor	Material	SCHEDULED VALUE
260536	Cable Trays for Electrical Systems	LS				$ -
260537	Boxes	LS				$ -
260553	Identification for Electrical Systems	LS				$ -
260554	Testing	LS				$ -
260555	Sleeves and Firestopping	LS				$ -
260800	Commissioning of Electrical Systems	LS				$ -
260920	Occupancy Sensors	LS				$ -
261200	Medium Voltage Transformers	LS				$ -
262413	Switchboards	LS				$ -
262416	Panelboards	LS				$ -
262717	Equipment Wiring	LS				$ -
262726	Wiring Devices	LS				$ -
262813	Fuses	LS				$ -
282818	Enclosed Switches	LS				$ -
262913	Enclosed Controllers	LS				$ -
263213	Engine Generators	LS				$ -
263600	Transfer Switches	LS				$ -
265100	Interior Lighting	LS				$ -
265600	Exterior Lighting	LS				$ -
271010	Structured Telecommunications Cabling and Enclosures	LS				$ -
275117	Intertelecommunication and Mass Notification System	LS				$ -
281300	Security Systems	LS				$ -
282300	Video Surveillance	LS				$ -
283100	Fire Detection and Alarm	LS				$ -
285240	Security Communications Emergency Phone System	LS				$ -
310000	Earthwork	LS				$ -
311300	Selective Tree Removal and Trimming	LS				$ -
312000	Building Structure Earthwork	LS				$ -
312513	Erosion and Sediment Control	LS				$ -
321216	Asphalt Paving	LS				$ -
321223	Textured Asphalt	LS				
321243	Porous Flexible Pavers	LS				
321300	Concrete Walks	LS				$ -
321373	Concrete Paving and Joint Sealants	LS				$ -
321640	Granite Curbs	LS				$ -
321723	Pavement Markings	LS				$ -
321823	Basketball Court Surfacing	LS				
323113	Chain Link Fence	LS				$ -
329120	Topsoil	LS				$ -
329219	Seeding	LS				$ -
329301	Plants	LS				$ -
329413	Landscape Edging	LS				$ -
331101	Water Utility Distribution Piping	LS				$ -
331216	Water Utility Distribution Valves	LS				$ -
331300	Disinfection of Water Utility Distribution	LS				$ -
333104	Plastic Drainage Pipe (Sanitary)	LS				$ -
333913	Manholes and Drainage Structures with Frames and Covers	LS				$ -
334100	Storm Utility Drainage Basin	LS				$ -
334104	Plastic Drainage Pipe (Storm)	LS				$ -
344113	Traffic Signs	LS				$ -
347113	Vehicle Guide Rails	LS				$ -
347115	Steel Pipe Bollards	LS				$ -
	TOTAL			$ -	$ -	$ -

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections and Contract Manager, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Contract Manager Software site.
6. Project meetings.

B. Each contractor shall participate in coordination requirements. Refer to Section 011200 – Contract Summary of Work for certain areas of responsibility that are assigned to a specific contractor.

C. Related Sections:

1. Section 011200 - Contract Summary of Work, for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 013200 - Project Scheduling and Progress Documentation, for preparing and submitting Contractor's construction schedule.
3. Section 017700 – Contract Closeout Requirements, for coordinating closeout of the Contract.
4. Section 019113 - General Commissioning Requirements, for coordinating the Work with Owner's commissioning authority.

1.3 DEFINITIONS

A. RFI: Request from the Owner, Design Professional, or Contractor seeking information from each other during construction.

1.4 COORDINATION

A. Coordination for Single Contract Project: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of

each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. The Contractor shall utilize the bid milestone schedule included in the Contract Documents to prepare a CPM schedule in accordance with Section 013200 – Project Scheduling and Progress Documentation. The Contractor shall submit the proposed CPM schedule to the Owner within 45 days of the Notice to Proceed. The submitted CPM schedule shall include double shifting as required by Section 011200 to achieve the bid milestones as well as anticipate adherence to campus quiet hours identified in Section 015000.
2. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
3. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
4. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Coordination of the Owner's P6 Project Management CPM schedule including implementation of double shifts as required by Section 011200 to achieve the bid milestones and adherence to campus quiet hours identified in Section 015000
2. Coordination of the commissioning process and activities.
3. Preparation of the schedule of values.
4. Entering dates each required submission item listed on the Contractor's Submission Schedule will be submitted, coordinated with the CPM Schedule.
5. Installation and removal of temporary facilities and controls.
6. Delivery and processing of submittals.
7. Progress meetings.
8. Preinstallation conferences.
9. Project closeout activities.
10. Startup and adjustment of systems.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.5 COORDINATED COMPOSITE DRAWINGS

A. Coordinated Composite Drawings, General: Prepare coordinated composite drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordinated composite drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordinated composite drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordinated composite drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls, including space required opening the access door.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to the Design Professional indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordinated Composite Drawing Organization: Organize drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on the Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordinated composite drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

a. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
d. Location of pull boxes and junction boxes dimensioned from column center lines.

8. Fire Protection System: Show the following:

a. Locations of mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: The Design Professional will review coordinated composite drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Design Professional determines that the coordinated composite drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Design Professional will so inform the Contractor, who shall make changes as directed and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files in accordance with the following requirements:

1. File Preparation Format: The Contractor shall coordinate with the Design Professional and use the same digital data software program, version, and operating system as the original Drawings.

1.6 KEY PERSONNEL

A. Key Personnel Names: Within 15 days after receipt of the Notice to Proceed, submit a list of key personnel assignments with resume and job qualifications, including project manager, project scheduler, commissioning agent, superintendent and other personnel in attendance at the Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers, and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to the Project.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, the Contractor shall prepare and submit an RFI in the form specified.

1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in the Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.

3. Date.
4. Name of Contractor.
5. Name of Design Professional.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the date of Substantial Completion or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: The Owner's Contract Manager-generated form with substantially the same content as indicated above.

D. Design Professional's Action: The Design Professional will review each RFI, determine action required, and respond. Allow a reasonable amount of working days for the Design Professional's response for each RFI. RFIs received by the Design Professional after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the date for Substantial Completion or the Contract Sum.
    e. Requests for interpretation of the Design Professional's actions on submittals.
    f. Incomplete RFIs or inaccurately prepared RFIs.

2. The Design Professional's action may include a request for additional information, in which case the Design Professional's time for response will date from time of receipt of additional information.
3. The Design Professional's action on RFIs that may result in a change to the date of Substantial Completion or the Contract Sum may be eligible for the Contractor to submit a Claim in accordance with procedures in General Conditions, Article 10 – Claims and Disputes.

    a. If the Contractor believes the RFI response warrants change in the date of Substantial Completion or the Contract Sum, notify the Owner in writing within fifteen (15) days of receipt of the RFI response.

E. On receipt of the Design Professional's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify the Owner and Design Professional within five days if the Contractor disagrees with response.

F. RFI Log: Coordinate and cooperate with the Owner to prepare, update and maintain the use of the Contract Manager RFI log. The RFI log will include not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Design Professional.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Design Professional's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 CONTRACT MANAGER SOFTWARE SITE

A. Coordinate and cooperate with the Owner for managing project communication and documentation until Contract Closeout. The Contract Manager software site may include, but is not limited to, the following functions:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Submittals forms and logs.
8. Payment application forms.
9. Online document collaboration.
10. Reminder and tracking functions.
11. Archiving functions.

1.9 PROJECT MEETINGS

A. General: The Owner and/or Design Professional will schedule and conduct meetings at the Project site, unless otherwise indicated.

1. Attendees: The Owner and/or Design Professional will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
2. Agenda: The Owner and/or Design Professional will prepare the meeting agenda through the use of the Owner's Contract Manager Software and distribute the agenda to all invited attendees.
3. Minutes: The Owner and/or Design Professional will record significant discussions and agreements achieved in Contract Manager and distribute the meeting minutes to everyone concerned.

B. Construction Kick-off Meeting: The Owner will schedule and conduct a construction kick-off meeting before starting construction, at a time convenient to the Owner and Design Professional, upon issuance of the Notice to Proceed.

1. The meeting shall review responsibilities and personnel assignments.
2. Attendees: The Owner, Owner's Commissioning Authority, Design Professional, and their consultants; the Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the meeting shall be familiar with the Project and authorized to make binding decisions on matters relating to the Work.
3. Agenda: The meeting agenda will include items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Sustainable design requirements.
    m. Preparation of As-builts and turnover documents.
    n. Use of the premises.
    o. Work restrictions.
    p. Working hours.
    q. Owner's occupancy requirements.
    r. Responsibility for temporary facilities and controls.
    s. Procedures for moisture and mold control.
    t. Procedures for disruptions and shutdowns.
    u. Construction waste management and recycling.
    v. Parking availability.
    w. Office, work, and storage areas.
    x. Equipment deliveries and priorities.
    y. First aid.
    z. Security.
    aa. Progress cleaning.
    bb. Safety.

4. Minutes: The Owner and/or Design Professional will use Contract Manager to record and distribute meeting minutes.

C. Progress Meetings: The Owner will conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: The Owner's Commissioning Authority, and Design Professional, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be

familiar with the Project and authorized to make binding decisions on matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of the Project.

   a. The Project Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to the Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

      1) Review schedule for next scheduled progress meeting period.

   b. Review present and future needs of each entity present, including the following:

      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Progress cleaning.
      10) Quality and work standards.
      11) Status of correction of deficient items.
      12) Field observations.
      13) Status of RFIs.
      14) Status of proposal requests.
      15) Pending changes.
      16) Status of Change Orders.
      17) Pending claims and disputes.
      18) Documentation of information for payment requests.

4. Minutes: The Owner and/or Design Professional entity responsible for conducting the meeting will use Contract Manager to record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Coordinate with the Owner to revise the Project Schedule after each progress meeting where revisions to the schedule have been made or recognized. The Owner will issue revised schedule concurrently with the report of each meeting.

D. Pre-installation Meetings: The Owner may conduct pre-installation meetings at the Project site before each construction activity that requires coordination with other construction and major assemblies of the Work requiring tight control and coordination.

   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with

other materials and installations that have preceded or will follow shall attend the meeting. The Owner to advise the Contractor, Design Professional and Owner's Commissioning Authority of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility problems.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written recommendations.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.

3. The Owner and/or Design Professional will use Contract Manager to record significant meeting discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: The Owner and/or Design Professional will distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the meeting cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the meeting at earliest feasible date.

E. Project Closeout Conference: The Owner may schedule and conduct a Project closeout conference, at a time convenient to the Owner and Design Professional, but no later than sixty (60) days prior to the scheduled inspection date for Substantial Completion.

1. The Owner will conduct the conference to review requirements and responsibilities related to the Project closeout.
2. Attendees: The Owner, Owner's Commissioning Authority, Design Professional, and their consultants; the Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting.

Participants at the meeting shall be familiar with the Project and authorized to make binding decisions on matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay the Project closeout, including the following:

   a. Submission of turnover documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Requirements for demonstration and training.
   d. Preparation of Contractor's punch list.
   e. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   f. Coordination of separate contracts.
   g. Owner's partial occupancy requirements.
   h. Installation of Owner's furniture, fixtures, and equipment.
   i. Responsibility for removing temporary facilities and controls.

4. Minutes: The Owner and/or Design Professional conducting meeting will use Contract Manager to record and distribute meeting minutes.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - PROJECT SCHEDULING AND PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections and Bid Milestone Schedule, apply to this Section.

1.2 SUMMARY

A. This is a single prime contract therefore the Contractor is responsible for the scheduling and documentation requirements as outlined in this section 013200.

B. Section includes administrative and procedural requirements to plan, schedule and document the progress of construction during the performance of the Work, including the following:

1. Critical Path Method (CPM) schedule and reports.
2. Material location reports.
3. Field condition reports.
4. Special reports.

C. Related Sections:

1. Section 011200 – Contract Summary of Work, for preparing a combined CPM Schedule.
2. Section 013300 – Submittal Procedure, for submitting schedules and reports.
3. Section 014000 – Quality and Code Requirements, for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Project: Work at the Site carried out pursuant to one or more Contracts.

B. Activity: A discrete part of the Contract that can be identified for planning, scheduling, monitoring, and controlling the Project. Activities included in a CPM schedule consume time and resources.

1. Critical Activity: An activity on the critical path that has no total float.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

C. Bid Milestone Schedule: Interim milestones, included in the Contract Documents, which the Contractor utilizes to formulate the Baseline Schedule.

D. Baseline Schedule: Initial schedule, prepared by the Contractor, to complete the Work of the Contract in accordance with the Contract duration and starting point to which schedule updates are compared.

E. CPM: Critical Path Method is a scheduling method used to plan and schedule construction projects where activities are arranged based on activity relationships creating a time scaled network diagram.

F. PDM: Precedence Diagram Method follows the standard CPM calculations and allows for special logic relationships creating an interdependent relationship throughout the network.

G. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no total float.

H. Data Date: The date when the status of the CPM schedule is determined, showing the calendar start date for the update period.

I. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either the Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Substantial Completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Substantial Completion date.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in both electronic (PDF) file format and as electronic backup file in native software format.

B. CPM Schedule: Schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (baseline or updated) and date on label.

C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain; activity ID number, activity description, original duration, remaining duration, actual duration, early and late start and finish dates and total float in calendar days.

1. Activity Report: List of all activities sorted by early or actual start date in each phase, area and level following the physical divisions of the Work.
2. Short Term Activity Report: Lists all activities occurring from the update data date in a two month forward and one month back window.

3. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by early or actual start date. Include activity ID number and float path(s).
4. Total Float Report: Provide a cumulative list of total float from each update period with comments associated to any and all variances.
5. Procurement Report: List all procurement activities sorted in order of the item being procured.
6. Narrative Report: The project scheduler shall describe the nature of the submission, interpretation of calculations, issues affecting progress and a milestone analysis comparing progress against the baseline and update schedules.

D. Material Location Reports: Submit at monthly intervals.

E. Field Condition Reports: Submit at time of discovery of differing conditions.

F. Special Reports: Submit at time of unusual event.

G. Qualification Data: For project scheduler.

1.5 QUALITY ASSURANCE

A. Project Scheduler Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within timeframes requested by the Owner. The project scheduler shall have or be able to obtain certification as a Planning and Scheduling Professional (PSP) or have a minimum of five years of demonstrated experience scheduling large capital projects.

B. Prescheduling Conference: The Owner may conduct conference at the Project site to comply with requirements in Section 013100 - Project Management and Coordination. Review methods and procedures related to the Baseline Schedule and the CPM schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss coordination, including phasing, work stages, area separations, interim milestones and Beneficial Occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies, and required inspections performed by the Owner.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of CPM schedules and reports with the performance of the Work and with CPM scheduling and reporting of separate Contractors.

1. Coordinate new Baseline Schedules and CPM schedule updates with separate Contractor's when additional Contracts are executed during the entire duration of the Project.

B. Coordinate CPM schedule with the Contractor's Submission Schedule, progress reports, and other required schedules and reports.

1. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CRITICAL PATH METHOD SCHEDULE, GENERAL

A. Bid Milestone Schedule: The Owner shall provide a Bid Milestone Schedule, which is attached to this section as a template for the Baseline Schedule. Nothing in the Bid Milestone Schedule, Baseline Schedule or CPM schedule shall preclude the Contractor from advancing the Work of the Contract.

1. Include milestones indicated in the Contract Documents in Baseline Schedule, including, but not limited to, the Notice to Proceed, interim milestones, Substantial Completion, and Contract close-out.
2. Substantial Completion date shall not be changed by submission of a schedule that shows an early completion date.
3. The Substantial Completion date shall not be changed for additional work or unforeseeable conditions. Additional shifts or work crews will be required to mitigate schedule implications of changes to maintain the Bid Milestone Schedule and Substantial Completion.
4. No time for weather will be apportioned for foreseeable occurrences in a specific regional area. The Contractor shall be responsible to determine reasonable averages and make allowances in the performance of the Work.

B. Activities: Treat each numbered activity as a consumable resource for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 15 days, unless specifically allowed by the Owner.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 - Submittal Procedures in schedule. Coordinate submittal review times in the CPM schedule with dates entered in the Contractor's Submission Schedule.
4. Startup and Testing Time: Include not less than 15 days for startup and testing.

5. Substantial Completion: Indicate completion on the date established for Substantial Completion, and allow time for the Owner's administrative procedures necessary to execute the Notice of Substantial Completion (NOSC).
6. Incomplete Work items and Contract Closeout: Include not more than 60 days for incomplete Work items and Contract Closeout Requirements.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents, or approved by the Owner prior to use and show how date constraints affect the sequence of the Work.

1. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities.

D. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

E. Resource and Manloaded Recovery CPM Schedule: When periodic update indicates any activity on the critical and/or longest path is 7 or more calendar days behind the current approved CPM schedule, submit a separate Resource and Manloaded recovery CPM schedule indicating means by which the Contractor intends to regain compliance with the CPM schedule. Indicate changes to working hours, working days, crew sizes, and equipment required achieving compliance, and dating by which recovery will be accomplished, subject to Owner's approval.

F. Computer Scheduling Software: Prepare CPM schedules using current version of a program that has been developed specifically to manage CPM schedules and interface with the Owner's electronic file of the Bid Milestone Schedule.

1. Utilize Primavera P6 or P3 Primavera Project Planner operating system.

2.2 CRITICAL PATH METHOD SCHEDULE (CPM SCHEDULE)

A. Baseline Schedule: Prepare schedule using a time-scaled PDM network diagram representing the Work of the Contract. Total float time shall be equal to zero in the Baseline Schedule.

1. Submit Baseline Schedule within 15 days of the date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work based on indicated activities.
2. Develop network diagram in sufficient time to submit Baseline Schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

a. Failure to include any work item required for the performance of the Work shall not excuse the Contractor from completing the Work of the Contract within applicable completion dates, regardless of the Owner's approval of the schedule.

B. CPM Schedule: Prepare contemporaneous schedules using a time-scaled PDM network for sequencing the Work and showing the progress of the Work.

1. Establish procedures for monitoring and updating the CPM schedule and for reporting progress. Coordinate procedures with the progress meeting and payment request date.
2. Coordinate the Work occurring concurrently through the integration of other Contractors Baseline Schedules into the CPM schedule.
3. Conduct educational workshops to train and inform the Contractor's key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract durations.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work of the Contract. At minimum, each individual specification section, including General Requirement sections, as indicated in the Project Manual, shall be listed as an activity.

1. Activities ID: Provide a unique identifier to each activity. No activity ID shall be recycled or reused.
2. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Mock-up of Materials.
h. Installation.
i. Work by Owner that may affect or be affected by the Contractor's activities.
j. Testing and commissioning.
k. Incomplete Work items and Contract closeout.

3. Actual Activity Dates: Once an activity has been assigned an actual date of occurrence, the status of that activity shall not change. Any change to actual dates must be accompanied with supporting data and approved by the Owner. No actual start date shall occur ahead of the data date.
4. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with the Bid Milestone Schedule dates.

5. Processing: Process data to produce output data status on a computer-drawn, PDM network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract duration.
6. Calculations: The schedule network shall be calculated allowing activities to retain their original logic. Progress override shall not be used when calculating the network status.
7. Logic: Leads and lags will not be used when the creation of an activity will perform the same function. Lag durations contained in the schedule shall not have negative value. Lead and lag durations shall not exceed the durations of the activity they are assigned.

    a. There shall be only two open ended activities; (1) Notice to Proceed, with no predecessor logic, and (2) Final Payment, with no successor logic. All intermediate activity logic shall be connected.
    b. Out of sequence activities that have progressed before all preceding logic will be allowed only on a case by case basis, as approved by the Owner. The Contractor shall propose logic corrections to eliminate all out of sequence progress and correct out of sequence progress that continues for more than two update cycles by logic revisions, as approved by the Owner.

8. Float: The Owner shall reject the schedule and schedule updates for the use of float suppression techniques such as preferential sequencing, special lead lags logic constraints, zero total or zero free float constraints, extended activity times, or imposing constraint dates other than what is required by the Contract.

    a. The use of resource leveling used for the purpose of artificially adjusting activity durations to consume float and influence the critical path is prohibited.
    b. A Progress Update Schedule showing work completing in less time than the Contract duration and accepted by the Owner, will be considered to have float.
    c. Any float generated during the performance of the Work, due to efficiencies of the Owner or any Contractor is not for sole use of the party generating the float.
    d. Negative float will not be a basis for requesting time extensions and will not be construed as a means of acceleration or schedule extension.

9. Format: Follow the applicable individual specification sections of the Work as the bases for the content of the CPM schedule. Organize the CPM schedule to provide the necessary detail for each area, level, quadrant and section as needed in the performance of the Work.

D. Changes in the Work: For each proposed change and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall CPM schedule.

E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed, including the reason each adjustment was necessary.

2. Changes in early and late finish dates.
3. Changes in activity durations in workdays.
4. Changes in the critical path.
5. Changes in total float or slack time.
6. Changes in the duration for Substantial Completion.

2.3 REPORTS

A. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise the Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CPM SCHEDULE

A. Project Scheduler: Engage a consultant or person skilled in construction planning and scheduling to provide planning, scheduling, evaluation, and reporting services using CPM scheduling.

1. In-House Option: The Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Project scheduler shall attend all meetings related to the Project progress, alleged delays, and time impact.

B. CPM Schedule and CPM Reports Updating: Prior to each scheduled progress meeting, update schedule to reflect actual construction progress and activities. Issue schedule and reports one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the CPM reports of each such meeting. As a minimum, schedule update submissions shall occur monthly and within 30 days of the schedule Data Date.
2. Include CPM reports with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final remaining duration for each activity.

C. Distribution: Submit one electronic copy, in format specified, to the Owner and distribute copies of approved schedule and reports to the Owner, Design Professional, separate contractors, testing and inspecting agencies, and other parties identified by the Owner with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules and reports to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013200.1 - PROJECT SCHEDULING AND PROGRESS DOCUMENTATION

BID MILESTONE SCHEDULE

1. **Milestone #1:** Access the building over the winter 2019 to perform field verifications for shop drawings and submittals.
2. **Milestone #2:** All project submittals 100% complete by April 1, 2019.
3. **Milestone #3:** Asbestos abatement Work of the Contract complete and accepted by July 1, 2019.
4. **Milestone #4:** The following must be completed and accepted by July 31, 2019:
   - Structural steel and light gauge roof framing and metal deck shall be complete for the fourth floor and attic roof addition.
   - Interior selective demolition Work of the Contract.
   - Concrete slab is placed in attic penthouse and Mechanical units set in attic.
5. **Milestone #5:** The following must be completed and accepted by August 15, 2019:
   - Roof sheathing and ice and water shield complete.
   - Foundations for the elevator, stair and brace frames.
   - New fire protection water service is installed to building and sanitary piping is replaced to the existing manhole on the north side of building.
   - Fire department connection Dry stand pipe is operation up to the 3rd floor prior to the enclosure of the 4th floor.
6. **Milestone #6:** The following must be completed and accepted by October 1, 2019:
   - Light gauge exterior wall framing, sheathing and air infiltration barrier complete at 4th and attic roof addition making building water tight.
   - Ground floor sub-slab plumbing installed and concrete slab complete.
   - Complete all structural floor openings, polymer reinforcing, intumescent coating, and cementitious underlayment on the upper levels.
   - Masonry partitions of stair and elevator constructed to the fourth floor and attic.
   - Structural steel brace frame is complete up through building.
   - North entrance vestibule addition, footings and foundation complete.
7. **Milestone #7:** Addition enclosed, access constructed, and both accepted by November 15, 2019. This includes the following:

- Complete exterior roofing, wall systems and cladding, and window enclosure to ensure a water-tight building envelope.
- Central steel stair is complete to attic providing contractor access to fourth floor and attic.
- All metal stud partitions and insulation at all existing perimeter exterior walls complete and ready for gypsum wallboard installation.
- Elevator and associated doors and frames installed.

8. **Milestone #8:** All interior metal stud partitions and all MEP/FP in wall rough-in work of the contract complete and accepted by December 15, 2019, which includes, but is not limited to, the following:
   - Interior metal stud partitions, framed and ready to receive wallboard.
   - All trades rough-ins in walls and above ceilings to be complete, inspected and accepted.
9. **Milestone #9:** Installation of interior wallboard on walls is complete taped, sanded and ready for finishes complete and accepted by February 15, 2020.
10. **Milestone #10:** Installation of interior wallboard on ceilings and all MEP/FP above ceiling rough-in work of the contract complete; taped, sanded and ready for finishes complete and accepted by March 15, 2020.
11. **Milestone #11:** The following work of the contract must be complete and accepted by April 15, 2020:
    - All mechanical and associated electrical Work of the Contract required for balancing of mechanical systems and commissioning.
    - Data Rooms complete clean and accepted.
12. **Milestone #12:** The west roadway and retaining wall must be complete and accepted by May 1, 2020.
13. **Milestone #13:** Preliminary air and hydronic balancing reports must be submitted to the Commissioning Agent by May 15, 2020.
14. **Milestone #14:** Work of the Contract at the point of Substantial Completion, as determined by the Owner, including the completion of Commissioning and the issuance of the Temporary Approval for Occupancy Requirements by **June 1, 2020**. See the Temporary Approval to Occupy Requirements in the subsequent page.
15. **Milestone #15:** Work of the Contract must achieve Final Acceptance, including completion of Punchlist items by June 16, 2020.
16. **Milestone #16:** Contractor shall upload all LEED information to LEED Online no later than August 1, 2020.

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DORMITORY AUTHORITY STATE OF NEW YORK

Memorandum

Date:
To:
From:
Project:
Re: Temporary Approval for Occupancy

In order to occupy the building, a Temporary Approval for Occupancy (TAO) must be obtained from the Construction Permitting Agency (DASNY). The following minimum building features, components, and systems must be completed, tested, and found acceptable/operable by DASNY in order for a TAO to be issued.

1. Certifications required prior to TAO being issued:
   a) NFPA 72 Record of Completion form (Fire Alarm Systems).
   b) NFPA 13 Above and Underground Piping Certificates (Sprinkler System).
   c) Statement of Compliance for Fire Protection Systems (include test reports)
   d) Electrical Inspection Certificate.
   e) Elevator Inspection Certificate.
   f) Boiler Inspection Certificate (New York State Department of Labor)
   g) Potable Water acceptable tests report
   h) RPZ or Back Flow Preventer test Certificate (if installed).
   i) Fire Pump acceptance test report.
   j) Special Suppression Systems (Kitchen or Clean agent) acceptance test reports.

2. Fire Alarm System, including:
   a) Fire alarm control panel and remote annunciator(s).
   b) Initiating and notification devices.
   c) Carbon Monoxide Sensors (System or Interconnected)
   d) One way voice communications.
   e) Fire fighter/warden phones.
   f) Fan shutdown.
   g) Special output and/or monitoring functions (egress access control, fire pump, generator, sub-systems, etc.)
   h) Campus or Supervisory Station connection.

3. Elevators, including:
   a) Acceptance tests (including test reports from **i**ndependent inspection firm QEI-1 Certified).
   b) Elevator recall (via key switch and smoke detection).
   c) Firefighters' Service (Phase II operation).
   d) Emergency voice communication and fire fighter voice communication.
   e) Power shunt-trip operation (if sprinklered).

4. Fire Protection Systems, including:
   a) Sprinklers (wet, dry, pre-action and/or deluge).

b) Standpipe (including fire department connection, fire hose valves).
c) Fire extinguishers.
d) Fire pump operation and monitoring (including flow and controller testing).
e) Hydraulic Data Plate and General Information Sign; The installing contractor shall provide a general information sign used to determine system design basis and information relevant the inspection, testing, and maintenance requirements required by NFPA 25.
f) Spare sprinkler cabinet with the appropriate number of sprinkler heads

5. Special Suppression Systems:
   a) Kitchen suppression systems (puff test, fuel and/or power cut-off).
   b) Clean agent suppression systems (dry chemical, FM200, etc).

6. Emergency Lighting and Power, including:
   a) Emergency generator (including full load tested).
   b) Emergency lighting, including battery pack units.
   c) Emergency power operation for fire pump, elevators, smoke control fans, etc.

7. Smoke Control/Purge System
   a) Fan operation (shut-down and re-start).
   b) Damper operation.
   c) Control panel functions.
   d) Stair pressurization.
   e) Smoke hatches (stair, hoistway and shaft).

8. Means of Egress, usable and clear, including:
   a) Free and unobstructed egress from the interior to the public way (corridors, stairways, sidewalks, etc).
   b) Exit signage (normal and emergency power).
   c) Exit door hardware and operation.
   d) Access control systems (including connection to fire alarm).

9. Fire Shutters or Rolling Fire Doors, including:
   a) Automatic and manual operation.
   b) Fire alarm connection.

10. Mechanical:
   a) Boiler inspection by NYS DOL.
   b) Heating system operational for occupancy between September 15 and May 31.
   c) Ventilation systems operational.
   d) Exhaust systems operational.
   e) HVAC control system operational.

11. Plumbing:
   a) Potable water system disinfected and tested by an approved testing lab with supporting documentation.
   b) Plumbing fixtures operational.
   c) Domestic hot water system and associated anti-scald devices are operational.

12.Fire-Rated Construction:

a) Corridor walls, stair/exit enclosures, occupancy separations, and other required fire-rated enclosures/separations complete.
b) Opening Protectives (Fire and Smoke Door operation)
c) Firestopping complete.
d) Fireproofing complete.

13.Other:

a) Swimming Pools:
    i) NYS Dept of Health Certification
    ii) Pool alarms
b) Privacy is provided in bathroom facilities.
c) Any condition that would create a fire safety or life safety hazard to occupants must be corrected or protected prior to occupancy. Please consult the assigned Code Administrator for guidance.
d) Project specific requirements to be determined.

If all the above items are found satisfactory, then an application for TAO can be submitted then the Code Compliance Unit. The TAO will be issued for the building (partial or entire) with appropriate conditions.

Should you have any questions, please advise.

cc:

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections and Contractor's Submission Schedule, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:

1. Section 013200 – Construction Progress Documentation, for submitting schedules and reports, includes Contractor's construction schedule.
2. Section 017700 – Contract Closeout Requirements, for documents required to closeout contract.
3. Section 017823 – Operation and Maintenance Manuals, for submitting operation and maintenance manuals.
4. Section 018113 – Sustainable Design Requirements for submission requirements for LEED and LEED on-line documentation to the USGBC.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require the Design Professional's responsive action. Action submittals are those submittals indicated in individual specification sections as action submittals.

B. Informational Submittals: Written and graphic information and physical samples that do not require the Design Professional's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual specification sections as informational submittals.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

D. Required Submittal List Utility application: Interacts with and to be used with the Owner's Contract Manager System. The Design Professional uses the utility to itemize the list of submission items needed to be submitted by the Contractor in order to insure the design intent will be satisfied and inclusive of all Project turnover documents and/or Contract Closeout Requirements.

E. Contractor's Submission Schedule: The itemized list of project submission requirements printed as a report from Contract Manager. The Contractor enters the date each item needs to be submitted in order to meet the CPM schedule and returns this document to the Owner.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: The Contractor's Submission Schedule is attached to this section, prepared by the Design Professional. The Contractor is to coordinate and cooperate with the Owner and Design Professional to arrange in chronological order by dates required by the construction schedule. Coordinate time required for review, ordering, manufacturing, fabrication, and delivery to establish dates. Coordinate additional time required for making corrections or modifications to submittals noted by the Design Professional and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate the Contractor's Submission Schedule with list of subcontracts, the schedule of values, and coordinated CPM schedule.
2. Initial Submittal: Submit in accordance with start-up CPM schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently in accordance with the complete CPM schedule.

    a. Coordinate with the Owner and Design Professional revised Contractor's Submission Schedule to reflect changes in current status and timing for submittals.

B. Format for Submittals: Submit required submittals in electronic (PDF) file format.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Design Professional's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by the Design Professional for the Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with the performance of the Work

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Commissioning Authority will review submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the Design Professional review and approval.
3. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
4. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

5. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Submit Operation and Maintenance Manuals concurrent with action submittal.
    b. The Owner or Design Professional reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on the Design Professional's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. The Design Professional will advise the Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Re-submittal Review: Allow 14 days for review of each re-submittal.
4. Sequential Review: Where sequential review of submittals by the Design Professional's consultants, the Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by the Design Professional.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Design Professional.
    d. Name of Construction Manager (if applicable).
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number including revision identifier.
        1) Submittal number shall be the specification section number followed by a number reflecting the order in which the submittal was received, followed by a revision number as required. For example the first submittal received for structural steel will be numbered or 053000-1-0 (the first submittal made in Section 053000). Subsequent submittals of the same submittal shall be numbered 053000-1-1, 053000-1-2.

j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Provide means for insertion to permanently record the Contractor's review and approval markings and action taken by the Design Professional.
4. Include the following information on an inserted cover sheet:

a. Project name.
b. Date.
c. Name and address of Design Professional.
d. Name of Construction Manager (if applicable).
e. Name of Contractor.
f. Name of firm or entity that prepared submittal.
g. Name of subcontractor.
h. Name of supplier.
i. Name of manufacturer.
j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Other necessary identification.

5. Include the following information as keywords in the electronic file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

F. Options: Identify options requiring selection by the Design Professional.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Additional Copies: Unless the Design Professional observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. The Design Professional will return submittals, without review, received from sources other than the Contractor.

1. Transmittal Form: Use the Contractor's office form. Contractor shall email transmittal if unable to issue transmittal notification through contract manager.
2. Transmittal Form: Provide locations on form for the following information:

a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Indication of full or partial submittal.
j. Drawing number and detail references, as appropriate.
k. Transmittal numbered consecutively.
l. Submittal and transmittal distribution record.
m. Remarks.
n. Signature of transmitter.

3. On an attached separate sheet, prepared on the Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by the Design Professional on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Re-submittals: Make re-submittals in same form and format.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from the Design Professional's action stamp.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, and installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals that are marked with approval notation from the Design Professional's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via upload to Contract Manager as electronic (PDF) files. Provide email notification to the Design Professional and Owners Representative at the time of upload. If applicable, the Design Professional will forward submittals to the Commissioning Authority for systems being commissioned. The Owner may request paper copies of certain submittals for onsite coordination.

a. The Design Professional, through the Owner, will return annotated file via upload to Contract manager, with electronic notification to the Contractor. Annotate and retain one copy of file as an electronic Project turnover document file.
b. The Commissioning Authority through the Design Professional will return annotated file.

2. Operation and Maintenance Manual Submittals: Submit concurrent with the Action Submittal, as related in individual Specification Sections.
3. Closeout Submittals: Comply with requirements specified in Section 017700 – Contract Closeout Requirements and as listed in the Contractor's Submission Schedule.
4. Permits, Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Permits, Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Submittal Package number and Submittal Item number.
b. Manufacturer's catalog cuts.
c. Manufacturer's product specifications.
d. Standard color charts.
e. Statement of compliance with specified referenced standards.
f. Testing by recognized testing agency.
g. Application of testing agency labels and seals.
h. Notation of coordination requirements.
i. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data concurrent with Samples.
6. Submit Product Data in electronic (PDF) file format.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Submittal Package number and Submittal Item number.
    b. Identification of products.
    c. Schedules.
    d. Compliance with specified standards.
    e. Notation of coordination requirements.
    f. Notation of dimensions established by field measurement.
    g. Relationship and attachment to adjoining construction clearly indicated.
    h. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Submittal Package number and Submittal Item number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: For turnover purpose, submit six full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. The Design Professional, through the Owner, will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in

manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit six sets of Samples. The Design Professional, through the Owner, will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a turnover sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least six sets of paired units that show approximate limits of variations.

E. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit subcontract list in PDF electronic file, to the Owner.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

H. OSHA Certificates: Upon the Owner’s request, submit certificates of the OSHA 10-hour Construction Safety and Health Course – S1537-A, for all laborers, workers and mechanics working on site.

I. Installer Certificates: Upon the Owner’s request, submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

J. Manufacturer Certificates: Upon the Owner’s request, submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

K. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

L. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

M. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to the Design Professional.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of the Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 DESIGN PROFESSIONAL'S ACTION

A. General: The Design Professional will not review submittals that do not bear the Contractor's approval stamp and will return them without action.

B. Action Submittals: The Design Professional will review each submittal, make marks to indicate corrections or modifications required, and return it through the Owner. The Design Professional will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: The Design Professional will review each submittal and will return it if it does not comply with requirements.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from the Design Professional.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

G. On projects that have commissioning, the Commissioning Authority will receive copies of the submittals through the Design Professional and will provide comments on the submittals via the Design Professional.

3.3 CONTRACTOR'S SUBMITTAL SCHEDULE

A. The Contractor's Submission Schedule: The Contractor's Submission Schedule, prepared by the Design Professional is attached following the end of this section. The Contractor shall provide the dates each item needs to be submitted to the Owner no later than 30 days after approval of CPM schedule. The schedule shall include the date of all shop drawings, samples, materials that shall be submitted and the date approval is required. The Contractor shall adhere to the submittal processing time as describe in paragraph 1.5 above when developing the submittal schedule. The Contractor is to coordinate and cooperate with the Owner and Design Professional to complete scheduling in accordance with the approved CPM schedule.

END OF SECTION 013300

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012901	Schedule of Values												
	Bonds / Insurance												
013100	Coordination Drawings												
013200	Project Schedule												
133000	Submittal Schedule with Lead times linked to CPM Schedule												
014510	Concrete Moisture test equipment												
	Test Reports and plans												
014520	Test equipment data												
	Calibration Certificates												
	Test reports and plans												
015000	Temp Facility Site plan												
	Erosion Control Plan												
	Moisture Proteciton Plan												
	Dust Control Plans												
	Temporary Fence shop drawings and data												
017329	Cutting and patching plan												
017419	Construction Waste Mangement												
	Waste Reduction Progress Reports												
	Waste Reduction Calcuations												
	Record of Donations												
	Record of Sales												
	Recycling and Processing Facility Records												
	Lanfill and Incenerator Disposal Records												
	LEED Submittal												
	Qualification Data												
	Statement of Refrigerant Recovery												
	Waste Manage ment Cooridinator Qualifications												
	Refrigeratn Technicain Qualifications												
	Regulatory Requirments												
017800	As Built Schedule												
	Sustainable Documentation												
	Permits, ceritifcations, licenses												
	Hazardous Waste documents												
017823	O&M Mnauals												
017839	As Built Documents												
018000	Commissioning												
	Construction Schedule												
	Equipment												
	Equipment												
	LEED Criteria (Fundamental Commissioning)												
	LEED Criteria (Enhanced Commissioning)												
018113	LEED Action Plan												
	LEED Monthly Progress Reports												
018114	Construction IAQ Management Plan												
	Construction Schedule												
	Construction IAQ Management Plan												
	List of Filtration Media												
	Filtration Media												
	Photographs												
	LEED Documentation												
024119	Selective Demolition and Removal												
028200	Pre-Work Submittals												
	Licenses												
	Prior Projects References												
	Notifications												
	Work Plan												

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	Landfill Permit												
	Waste Transport Permit												
	Closeout Submittals												
	Waste disposal records												
	OSHA compliance air monitoring records												
	Daily progress logs, including the entry/exit logs												
	Contractor's Acknowledgement Statement												
	Disposal Site/Landfill Permit from applicable regulatory agency												
	Project notifications, amended notifications, Variances												
028400	Pre-Work Submittals												
	Work Plan												
	Landfill Permit												
	Letter of Acceptance from landfill for PCB waste disposal												
	Waste Transport Permit												
	Waste disposal manifests												
	Daily progress logs												
	Contractor's Acknowledgement Statement												
	Disposal Site/Landfill Permit from applicable regulatory agency												
028600	Hazardous Waste												
028700	Universal Waste and Fluorescent Lamps												
033000	LEED Documentation												
	Footings & Rebar Shop Drawings												
	Mix Design												
	Lean Concrete												
	Flowable Fill												
	Formwork Shop Dwgs for Suspended Slabs												
	Construction Joint Layout Plan (Slabs)												
	Material Ceritficates												
	Material Test Reports												
	Slab on grade Mockup (Exterior)												
035416	Concrete Floor Underlayment												
	Moisture Control System												
	Product Data for Credit MR 4												
040120	Masonry restoration cleaner												
	Stain Remover												
	General masonry cleaner												
	Masonry Sealer												
040122	Mortar												
	Color samples												
	LEED Documentation												
042000	Concrete Masonry units												
	Exterior Concrete Masonry samples for selection												
	Mortar												
	Grout												
	Joint Reinforcing												
	Masonry ties												
	Reinforcing shop drawings and data												
	LEED Documentation												
	Shop Drawings												
	Mockup												
051200	Structural Steel												
	Technician Qualifications												
	Structural Steel												
	Proposed Connection Types												

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	Column Layout Plan												
	Floor and Roof Framing Plans												
	Shop Erection Details												
	Welds											05100.1	
	Anchor Bolts												
	Shop Welded Masonry Anchors												
	Shop Finishing Information												
	Steel Plates, Shapes, Bars												
	Steel Tubing & Pipe												
	Unfinished Bolts, Nuts & Washers												
	High Strength Bolts, Nuts & Wash.												
	Anchor Bolts, Nuts & Washers												
	Welding Electrodes												
	Steel Primer Paint												
	Hot Dipped Galvanizing												
	Weld-On Masonry Anchors												
	Below Grade Coating												
	Cold Galvanizing												
	LEED Documentation												
051213	AE Structural Steel Shop Drawings												
	Quality standards submittals												
	Mockup												
	LEED Documentation												
052100	Steel Joist Framing												
053100	Metal Roof Deck - Regular												
	Metal Roof Deck - Cellular												
	Metal Deck - Form Deck												
	Test Reports												
	Welding and Prodcut Certificataes												
	Field Quality Control Submittals												
	Shop Drawings												
	Finish data												
	Finish Samples												
	LEED Documentation												
054000	Product Data												
	Qualification Data												
	Welding certificates												
	Test Reports												
	Shop Drawings												
054400	Cold-Formed Metal Trusses												
055000	Interior Steel handrail shop drawings												
	Exterior steel guardrail shop drawings												
	Exterior steel cable guardrail shop drawings												
	Steel ladder shop drawings												
	Steel lintel shop drawings												
	Steel bollard shop drawings												
	Metal pan stair shop drawings												
	Metal grate data and shop drawings												
	Product Data												
	LEED Documentation												
057300	Prefabricated Glass Railing System Data												
	Shop Drawings												
	LEED Documentation												
	Samples												
	Test Reports												
	Quailifications												

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061000	Rough Carpentry												
	Presure Treated Lumber												
	Presure Treated Plywood Sheathing												
	Fire-Retardant Treated Plywood												
	Adhesives												
	LEED Documentation												
	Certifications												
061643	Gypsum wall sheathing												
	Gypsum coverboard												
	Plywood sheathing												
	Ext FT Plywood sheathing												
	Fastener product data												
	LEED Documentation												
062023	Interior Finish Carpentry												
064000	Plastic Laminate Data and samples												
	Particleboard												
	Plywood												
	Lumber												
	Support Legs												
	Grommets												
	Cabinet Hardware												
	Shop Drawings												
	LEED Documentation												
064100	Product Data for panels												
	Product Data for adhesive												
	Shop drawings for panels												
	Samples												
	LEED Documentation												
066116	Solid Surface product data												
	Shop Drawings												
	Samples												
	Maintenance Data												
	LEED Documentation												
072100	Fiberglass Insulation												
	Subgrade Insulation												
	Masonry insulation												
	Rigid insulation												
	Vapor barrier												
	Class A vapor barrier												
	Air Barrier												
	Sill sealer												
	Rigid Insulation at attic												
	Thermal acoustic insulation and fasteners												
	LEED Documentation												
072210	HVAC Balance Reports												
	IAQ Testing Reports												
	IAQ Test Plan												
	LEED Documentation												
072400	Synthetic Stucco System type 1 - product data												
	Synthetic Stucco System type 2 - product data												
	Synthetic Stucco System type 3 - product data												
	Synthetic Stucco System type 1 - sample												
	Synthetic Stucco System type 2 - sample												
	Synthetic Stucco System type 3 - sample												
	LEED Documentation												
074113	Metal roof panels data												

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	Fastener product data												
	Metal panel shop drawings												
	Finish samples												
	Underlayment												
	Sealant												
	Snow Guards												
	Gutter shop drawings												
	Gutter Screen data and shop drawings												
	Downspout shop drawings												
	LEED Documentation												
074200	Composite Stone Panels												
074213	Metal Wall Panels												
075423	Single Ply Roofing Warranty												
	Single Ply Roofing system Product Literature												
	Roofing details												
	Cover Board												
	Fastener pullout reports												
	Samples												
	Roofing Manufacturers Certificaation letter												
	Test reports												
	RooF NAV Assembly												
	Warranty												
	LEED Documentation												
076200	Metal data												
	Metal finish samples												
	Fastener product data												
	Metal Shop Drawings												
	LEED Documentation												
077200	Ridge Vent data												
	Soffit Vent data												
	Floor Hatch data, drawing and test data												
	Shop drawings												
078120	Intumescent Fire Resistant Material												
078400	Fire Stopping data												
	Design Listings												
	Installation instructions												
	Firestop Log												
	Qualificatin data												
	Quality Control Manual												
	Firestop application Log												
079200	Product data on all sealants & backing material												
	Samples for color selection												
	Mockups with backer rod and sealant												
	Mineral Fiber Insulation												
	LEED Documentation												
081113	Hollow Metal Frames data												
	Hollow Metal Frames shop drawings & schedule												
	Hollow Metal Doors data												
	Hollow Metal Doors shop drwaings & schedule												
	LEED Documentation												
081416	Wood Doors												
	Fire-Rated Flush Wood Door												
	Wood Door Schedule												
	Fisnish Samples												
	LEED Documentation												
	Warranty												

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083113	Fire Rated Access Door data												
	Non Rated Aaccess Door data												
	LEED Credit MR 4 recycled content												
083500	Folding Door product data												
	Folding door shop drawing												
	LEED Documentation												
084100	Aluminum Framed Entrances and Storefronts												
085113	Window Data												
	Window Shop Drawings												
	Finish Samples												
	Pre-Construction Condition Report												
	LEED Documentation												
087100	Hinges												
	Closers												
	Power Door Operator												
	Actuator												
	Silencers												
	Wall & Floor Bumpers and Holders												
	Locksets and Latches												
	Cylinders												
	Deadbolts												
	Exit Devices												
	Power Transfers												
	Thresholds, Door Sweeps												
	Weatherstripping												
	Pulls, Pushplates												
	Flush Bolts												
	Hardware Schedule												
	Keying Schedule												
088000	Clear Float Glass												
	Tempered glass												
	Insulated Safety Glass												
	Insulated Spandrel Glass												
	Insulated Transluscent Glass												
	Stair Ballustrade Glass												
	Fire Protective Safety Glass												
	Certification												
	Glazing Tapes												
	Glazing Sealant												
	Gflazing Gaskets												
	Setting Blocks												
088860	Fire protection Framing & glass product data												
	Fire protection Framing shop drawings												
	Fire Protection Doors												
	Fire Protection hardware												
	Hardware Schedule												
	Sealant												
	LEED Documentation												
089100	Metal Louver Gate Shop Drawings												
	Welding Ceritification												
	Product Data												
092100	Wall Support Framing												
	Deflection Track												
	Ceiling Support Framing												
	Curved Ceiling Support Framing												
	Gypsum Board												

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	Impact Resistant Gypsum Board												
	Exterior Gypsum Soffit Board												
	Cementituos Backer board												
	Cornerbead												
	Edge trim												
	Control joint												
	Joint Treatment Materials												
	Spray on Ceiling Finish												
	Acoustic Insulation												
	Acoustical Sealant												
	LEED Documentation												
	Wall mockup												
095100	Acoustic Ceiling Tile data and samples												
	Acoustical Ceiling Grid data and samples												
	Ceiling trim & accessories												
	LEED Documentation												
095400	Linear cileing data and samples												
	Linear ceiling suspension details												
	test reports												
	LEED Documentation												
096500	Vinyl Tile data and samples												
	Linoleum Tile data and samples												
	Linoleum Plank data and samples												
	Rubber Floor System data and samples												
	Rubber Base data and samples												
	Leveling compund												
	Resilient Edge Strips												
	Adhesives												
	LEED Documentation												
096705	Epoxy Flooring Type 1 - product data												
	Epoxy Flooring Type 1 - sample												
	Epoxy Flooring Type 2 - product data												
	Epoxy Flooring Type 2 - sample												
	Moisture mitigation primer data												
	Epoxy Underlayment data												
	Sealant data												
	LEED Credit MR 5 Distance from project												
096800	Carpet sample and data												
	Carpet Edge guard data and samples												
	Layout Drawing												
	Adhesive data												
	Leveling compund data												
	LEED Documentation												
098413	Fixed sound abosorbtive panels product data												
	shop drawings												
	samples												
	adhesive												
	Mockup												
	LEED Documentation												
099100	Exterior Paint - Galv Metal												
	Exterior Paint - ferrous metal												
	Interior Paint - GWB type 1												
	Gypsum Drywall and Plaster Type 2												
	Ferrous metal Type 1												
	Ferrous metal Type 2												
	Masonry type 1												

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	Masonry type 2												
	Masonry type 3												
	Interior Paint - Metal type 1												
	Interior Paint - Metal type 2												
	Cementitious flooring coating												
	LEED Documentation												
101100	Visual display surfaces product data												
	Shop drawings												
	Samples												
	Adhesive												
	LEED Documentation												
101139	visual display rails product data												
	Color samples for selection												
101400	Product Data												
	Signage Schedule												
	Shop Drawings												
	LEED Documentation												
102113	Toilet compartment product data												
	finish samples												
	LEED Documentation												
102213	Product Data												
	Shop Drawings												
	Color Samples												
102610	Corner Guards Data												
	Corner Guard samples												
102623	Fiber Reinforced Plastic Panels												
102813	Toilet Accessories data												
	Samples for color selection												
	Mounting Details												
	LEED Documentation												
104400	Fire Extinguishers and Cabinets												
	Fire Extinguishers												
	LEED Documentation												
105113	Metal Lockers data												
	LEED Documentation												
105500	Mail Box Shop Drawings												
	Placard Data and schedule												
	LEED Documentation												
108200	Shower and tub surround product data												
	Installation details												
	finish samples												
	LEED Documentation												
113100	Undercounter refrigerator												
	Refrigerator												
	Range												
	Microwave												
	Range hood												
	Kitchen Hood												
	Energy Star documentation												
122400	Window Shades												
123530	Residential Casework - product data												
	shop drawings												
	finish samples												
	LEED Documentation												
124813	Floor Mats product data												
	Shop Drawings												

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	Samples												
	LEED Documentation												
129300	Bench Product Data												
	Basketball Bench Product Data												
	Basketball Hoop Assembly												
133300	SRW Shop Drawings w/PE stamp												
	Manufacturer Certification												
142100	Elevator data												
	Elevator shop drawings												
	Finish samples												
	Warranty Ceritficate												
	Maintenance Proposal												
	LEED Documentation												
144200	Lift Data												
	Lift Shop Drawings												
	Finish Samples												
	Warranty Certificate												
	LEED Documentation												
	O&M Manuals												
	Inspectiona nd acceptance certificates												
210500	Common Work Results for Fire Suppression												
	Sprinkler floor plans												
	Pipe Hangers and Supports												
	Valves												
210517	Sleeves and Sleeve Seal for Fire Suppresion Piping												
210518	Escutcheons for Fire Suppression Piping												
210553	Identification for Fire Suppression Piping and Equipment												
211313	Wet-Pipe Sprinkler System												
	Pipe and Fittings												
	Valves												
	Sprinklers												
	Backflow Preventer												
	Alarm Check Valves and Trim												
	Waterflow Switch												
	Electric Alarm Bell												
	Fire Dept Connection and Accessories												
	Valve Tamper Switches												
	Test and Drain Fitting												
	Pressure Gages												
213113	Fire Pump												
	Jockey Pump												
	Fire Pump Controller												
	Jockey Pump Controller												
220100	Plumbing Floor Plans												
220523	Valves												
	Backflow Preventers												
220529	Hangers												
	Supports												
220700	Insulation												
220800	Commissioning of Plumbing Systems												
221116	Piping & Fittings												
221123	Sump Pump												
	Recirculating Pump												
	Duplex Booster Pump												
	Diaphragm Tank												
221124	Testing and Adjustments												

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221319	Drains												
	Shock Absorbers												
	Hose Bibbs												
	Wall Hydrants												
	Gauges												
	Master Tempering Valve												
	Washing Machine Box Outlet												
	Thermometers												
	Escutcheons												
	Dielectric Fittins												
	Pipe Sleeves												
	Vacuum Breakers												
	Fixture Stops												
	Clean Outs												
	Trap Seal												
	Lint Interceptor												
	Meters												
	Regulators												
221320	Water Heaters												
	Expansion Tank												
221330	Fixtures												
	Trimings												
	Faucets												
	Traps												
	Supports												
224000	Approved Manufacturers for Plumbing Work												
230513	Common Motor Requirements for HVAC Equipment												
230519	Meters and Gages for HVAC Piping												
230553	Identification for HVAC Piping and Equipment												
230593	Testing, Adjusting and Balancing for HVAC												
230713	Duct Insulation												
230716	HVAC Equipment Insulation												
230719	HVAC Piping Insulation												
230800	Commissioning of HVAC Equipment and Systems												
230924	Bill of material product data												
	DDC Control System product data												
	Wiring Diagram shop drawings												
	Operator Interface shop drawings												
230993	Sequence of Operations for HVAC Controls												
232113	Hydronic Piping												
232114	Hydronic Specialties												
232123	Hydronic Pumps												
233100	HVAC Ducts												
233300	Air Duct Accessories												
233413	Axial HVAC Fans												
233416	Centrifugal HVAC Fans												
233700	Air Outlets and Inlets												
235700	Heat Exchangers for HVAC												
237201	Air-to-Air Energy Recovery Equipment												
237202	Small Air-to-Air Energy Recovery Equipment												
238101	Terminal Heat Transfer Units												
238127	Small Split-System Heating and Cooling												
238216	Air Coils												
240100	Commissioning Requirements												
260501	Electrical Demolition												

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260502	Removal of Fluorescent Light Ballasts/Capacitors and Fluorescent Light Tubes												
260503	Common Requirements for Electrical Work												
260505	Arc Flash Study												
260513	Medium Voltage Cables												
260519	Low-Voltage Electrical Power Conductors and Cables (600V and Less)												
260526	Grounding and Bonding for Electrical Systems												
260529	Hangers and Supports for Electrical Systems												
260534	Conduit												
260535	Surface Raceways												
260536	Cable Trays for Electrical Systems												
260537	Boxes												
260553	Identifucation for Electrical Systems												
260554	Testing												
260555	Sleeves and Firestopping												
260800	Commissioning of Electrical Systems												
260920	Occupancy Sensors												
261200	Medium Voltage Transformers												
262413	Switchboards												
262416	Panelboards												
262717	Equipment Wiring												
262726	Wiring Devices												
262813	Fuses												
282818	Enclosed Switches												
262913	Enclosed Controllers												
263213	Engine Generator Product Data												
	Engine Generator Shop Drawings												
263600	Transfer Switches												
265100	Interior Lighting												
265600	Exterior Lighting												
271010	Telecom Product data												
	Telecom Shop Drawings												
	Manufacturers Qualifications												
	Installer Qualifcations												
	Test Plan												
	Field Test Reports												
275117	Mass Notification Shop Drawings												
	Mass Notification Priodcut Data												
	Manufacturers Certificate												
	Operation Data												
	Maintenance Data												
281300	Security Systems												
282300	Video Surveillance												
283100	Fire Detection and Alarm												
285240	Security Communications Emergency Phone System												
310000	Filter Fabric Product Data												
	Material Samples for Testing												
	Material Source data												
311300	Qualification Data												
312000	Structural Fill												
	General Fill												
	Excavated Materials												
	Slab Subbase												
	Pavement Subbase												
	Pipe Bedding												

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	Filter Fabric												
	Course Aggregate - material test data sheets												
	Filter Material - material test data sheets												
	Rip Rap - material test data sheets												
	Pea Stone - material test data sheets												
	Geotextiles- product data												
	CLSM - Design mix, material test data sheets, strength												
	Detectable warning tape - product data												
312513	Silt fence - product data												
	Orange Warning Fence - product data												
	Inlet Protection - product data												
	Temp Seed mix - product data												
321216	Asphalt pavement - mix design, DOT approvals.												
321223	Textured Asphalt												
321243	Permeable Pavers - Prodcut Data												
	Permeable Pavers - shop drawings												
	Parking Delineators - Product Data												
	Bse Course - Product Data												
	Geo grid - product data												
	Manufacturer Qualifications												
	Installer Qualifcations												
321300	Concrete mix design Report												
	Concrete Product Data												
	Detecable warming surface samples												
	Wire Mesh - Product data												
321373	Sealant Product Data												
	Sealant Color samples												
321640	Granite Curbs												
321723	Color Samples of Pavement Marking												
	Paint Product Data												
321823	Basketball Court Surfacing												
323113	Chain Link Fence												
329120	Topsoil - samples												
	Limestone - product data												
329219	Seeding												
	Hydro mulch - product data												
	Seed - sample, seed analysis												
	fertilizer - product data												
329301	Plants												
329413	Steel Edging Product Data												
	Installation Instructions												
331101	Water utility distribution piping - product data												
331216	Valve Scheudle												
	Valve Product Data												
331219	Seeding												
331300	Disinfection of Water Utility Distribution												
333104	Plastic Drainage Pipe (Sanitary) - Product Data												
333913	Manhole Product Data												
	Manhole Shop Drawings												
	Frame and Grate product data												
	Mortar Product Data												
334100	Storm Utility Drain Basin Shop Drawings												
	Storm Utility Drain Basin Product Data												
334104	Corrugated Polyethylene Storm Pipe												
344113	Traffic Signs												
347113	Vehicle Guide Rail - Shop Drawings												

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347115	Steel Pipe Bollard - Product Data												
	Lift Assist Bollard - Product Data												

SECTION 014000 - QUALITY AND CODE REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections and New York State (NYS) Statement of Special Inspections and Tests, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit the Contractor's other quality assurance and quality control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for the Contractor to provide quality assurance and quality control services required by the Owner or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:

1. Section 012100 - Allowances, for testing and inspecting allowances.
2. Section 013200 - Construction Progress Documentation, for developing a schedule of required tests and inspections.
3. Individual Specification Sections, for specific inspections and tests requirements.

1.3 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements.

C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate

aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Product Testing: Tests and inspections that are performed by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

G. Installer/Applicator/Erector: The Contractor or another entity engaged by the Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

H. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality Control Plan: For quality assurance and quality control activities and responsibilities.

B. Contractor's Quality Control Manager Qualifications: For supervisory personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.

4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality control service.

1.6 CONTRACTOR'S QUALITY CONTROL PLAN

A. Quality Control Plan, General: Submit quality control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to the Owner. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality assurance and quality control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality assurance and quality control procedures similar in nature and extent to those required for Project.

1. Project quality control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: Include in quality control plan a comprehensive schedule of the Work requiring tests or inspections, including the following:

1. The Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and the Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "NYS or NYC Statement of Special Inspections and Tests."

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work the Owner has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.8 PERMITS, LICENSES, AND CERTIFICATES:

A. The Contractor shall obtain, maintain and pay for all applications, permits, filings, and licenses necessary for the execution of the Work and for the use of such Work when completed as required by any and all authorities having jurisdiction. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of authorities having jurisdiction bearing on performance of the Work.

B. The Contractor shall promptly assist the Owner in securing all approvals from authorities having jurisdiction. Without limitation, the Contractor shall assist the Owner in making application for Project approval, variances or other approvals, Letters of Completion, Temporary Certificates of Occupancy, and Certificates of Occupancy, including completion of all necessary applications and supporting documentation.

C. The Contractor shall comply with all regulations governing conduct, access to the premises, operation of equipment and systems and conduct while in or near the premises and shall perform the Work in such a manner as not to unreasonably interrupt or interfere with the conduct of business of the Institution.

D. For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, material certificates/affidavits, approvals, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

E. Dormitory Authority Permits: Prior to commencement of the Work, the Dormitory Authority shall provide the Contractor, at no costs, a Construction Permit for performance of the Work and post a copy at the Project site.

1. The Contractor shall secure and pay for all other work permits, applications, filings, and approvals that are associated with the Work of the Contract and pay all other permits, fees, licenses and inspections necessary for the proper execution and completion of the Contract as required by all other applicable authorities having jurisdiction.
2. The Contractor shall, at no additional costs to the Owner, provide for inspection of all electrical Work of the Contract and provide a certificate of compliance from an independent electrical inspection agency acceptable to the Owner.
3. The Contractor shall secure required building permit or work permits and approvals prior to commencement of the Work, provide a copy to the Owner and post a copy of the permit at the Project site.
4. The Contractor shall be responsible to maintain updated permits and approvals.
5. Upon Substantial Completion of the Work of the Contract, the Contractor shall secure all required approvals from applicable authorities having jurisdiction. The Contractor shall provide a copy to the Owner.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project,

whose work has resulted in construction with a record of successful in-service performance.

E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

F. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329**,** and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by the Owner.
2. Notify the Owner seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain the Owner’s approval of mockups before starting work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed by the Owner.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality control services are indicated as the Owner's responsibility, the Owner will engage a qualified testing agency to perform these services.

1. The Owner will furnish the Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to the Owner are the Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of the Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as the Contractor's responsibility, engage a qualified testing agency to perform these quality control services.

    a. Contractor shall not employ same entity engaged by the Owner, unless agreed to in writing by the Owner.

3. Notify testing agencies at least 24 hours in advance of time (excluding weekends and holidays) when Work that requires testing or inspecting will be performed.
4. Where quality control services are indicated as the Contractor's responsibility, submit a written report, in duplicate, of each quality control service.
5. Testing and inspecting requested by the Contractor and not required by the Contract Documents are the Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 - Submittal Procedures.

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting:

1. Regardless of whether original tests or inspections were the Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents, or costs attributable to the Contractor's lack of coordination in properly scheduling the Work requiring testing and inspection will be charged to Contractor and the Contract Sum will be adjusted by Change Order.

F. Testing Agency Responsibilities: Cooperate with the Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify the Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a written report, in duplicate, of each test, inspection, and similar quality control service through Contractor.
5. Does not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of the Contractor.

G. Associated Services: The Contractor shall cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. The Contractor shall provide the following:

1. Access to the Work, including equipment required to access the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to the Owner, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 NYS | SPECIAL INSPECTIONS AND TESTS

A. Special Inspections and Tests: The Owner will engage a qualified testing agency to conduct special inspections and tests required by authorities having jurisdiction as the responsibility of the Owner, as indicated in the NYS | Statement of Special Inspections and Tests, attached to this Section, and as follows:

1. Notifying Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Submitting a written report of each test, inspection, and similar quality control service to the Owner with copy to the Contractor and to authorities having

jurisdiction. Frequency of reporting shall be determined in consultation with the Owner.

3. Submitting a final report of special tests and inspections at Substantial Completion, this includes a list of unresolved deficiencies.
4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents or code requirements.
5. Retesting and reinspecting corrected work.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve a Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's quality control procedures that facilitate compliance with the Contract Document requirements.
2. Inspections and tests performed by the testing agency shall in no way relieve the Contractor of the responsibility to construct in accordance with the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to the Design Professional.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for the Owner’s reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality control service activities.

C. Repair and protection are the Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

END OF SECTION 014000

2016 NYS BUILDING CODE
STATEMENT OF SPECIAL INSPECTIONS

BCNYS §1704.3 requires that the project Registered Design Professional in responsible charge prepare a Statement of Special Inspections. Completion of this Statement of Special Inspections and submission to the Code Compliance Unit with the Construction Permit Application is a condition for issuance of the Construction Permit.

Campus/Facility: State University of New York at New Paltz		
Project Title: Deyo Hall Rehabilitation and Upper Floor Addition		
Project #: 341830	**DASNY Project Manager:** Denise Platt	
Registered Design Professional (RDP): Spring Line Design Architecture + Engineering, LLP		
Name of Person Completing Statement: Chris Snyder, PE	**Phone:** 518 487-4755	**Date:** 07/09/2018
Comments:		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
A. Special Cases (Add requirements under Part S as necessary)			1705.1.1			Special Inspections and Tests shall be required for proposed work that is, in the opinion of the building official, unusual in its nature.
B. Steel Construction.			1705.2			
1. Structural Steel			1705.2.1			
a. Inspection tasks prior to welding;			1705.2.1			AISC 360 Table N5.4-1
i. Welding procedure specifications (WPSs) available	X		1705.2.1	☒		AISC 360 Table N5.4-1
ii. Manufacturer certifications for welding consumables available	X		1705.2.1	☒		AISC 360 Table N5.4-1
iii. Material identification (type/grade)		X	1705.2.1	☒		AISC 360 Table N5.4-1
iv. Welder identification system		X	1705.2.1	☒		AISC 360 Table N5.4-1 The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type.
v. Fit up of groove welds (including joint geometry)		X	1705.2.1	☒		AISC 360 Table N5.4-1

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
vi. Configuration and finish of access holes		X	1705.2.1	☒		AISC 360 Table N5.4-1
vii. Fit-up of fillet welds		X	1705.2.1	☒		AISC 360 Table N5.4-1
viii. Check Welding equipment		X	1705.2.1	☒		AISC 360 Table N5.4-1
b. Inspection Tasks During Welding			1705.2.1			AISC 360 Table N5.4-2
i. Use of qualified welders.		X	1705.2.1	☒		AISC 360 Table N5.4-2
ii. Control and Handling of welding consumables.		X	1705.2.1	☒		AISC 360 Table N5.4-2
iii. No welding over cracked tack welds.		X	1705.2.1	☒		AISC 360 Table N5.4-2
iv. Environmental Conditions		X	1705.2.1	☒		AISC 360 Table N5.4-2
v. Verify WPS followed		X	1705.2.1	☒		AISC 360 Table N5.4-2
vi. Verify Welding Techniques		X	1705.2.1	☒		AISC 360 Table N5.4-2
c. Inspection Tasks after Welding			1705.2.1			AISC 360 Table N5.4-3
i. Welds cleaned		X	1705.2.1	☒		AISC 360 Table N5.4-3
ii. Size, length, and location of welds	X		1705.2.1	☒		AISC 360 Table N5.4-3
iii. Welds meet visual acceptance criteria	X		1705.2.1	☒		AISC 360 Table N5.4-3
iv. Arc strikes	X		1705.2.1	☐		AISC 360 Table N5.4-3
v. K-area			1705.2.1	☐		AISC 360 Table N5.4-3; When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 in. (75mm) of the weld.
vi. Backing removed and weld tabs removed (if required)	X		1705.2.1	☐		AISC 360 Table N5.4-3
vii. Repair activities	X		1705.2.1	☒		AISC 360 Table N5.4-3
viii. Document acceptance or rejection of welded joint or member	X		1705.2.1	☒		AISC 360 Table N5.4-3
d. Inspection Tasks Prior to Bolting			1705.2.1			AISC 360 Table N5.6-1
i. Manufacturer's certification available for fastener materials	X		1705.2.1	☒		AISC 360 Table N5.6-1
ii. Fasteners marked in accordance with ASTM requirements		X	1705.2.1	☒		AISC 360 Table N5.6-1
iii. Proper fasteners selected		X	1705.2.1	☒		AISC 360 Table N5.6-1

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane)						
iv. Proper bolting procedure selected for joint detail		X	1705.2.1	☒		AISC 360 Table N5.6-1
v. Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements.		X	1705.2.1	☒		AISC 360 Table N5.6-1
vi. Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used.		X	1705.2.1	☒		AISC 360 Table N5.6-1
vii. Proper storage provided for bolts, nuts, washers and other fastener components.		X	1705.2.1	☒		AISC 360 Table N5.6-1
e. Inspection Tasks During Bolting			1705.2.1			AISC 360 Table N5.6-2
i. Fastener assemblies, of suitable condition, placed in all holes and washers (if required) are positioned as required.		X	1705.2.1	☒		AISC 360 Table N5.6-2
ii. Joint brought to the snug-tight condition prior to the pretensioning operation.		X	1705.2.1	☒		AISC 360 Table N5.6-2
iii. Fastener component not turned by the wrench prevented from rotating.		X	1705.2.1	☒		AISC 360 Table N5.6-2
iv. Fasteners are pretensioned in accordance with the RCSC Specification, progressing systematically from the most rigid point toward the free edges.		X	1705.2.1	☒		AISC 360 Table N5.6-2
f. Inspection Tasks After Bolting			1705.2.1			AISC 360 Table N5.6-3
i. Document acceptance or rejection of bolted connections.	X		1705.2.1	☒		AISC 360 Table N5.6-3
g. Inspection of Steel Elements of Composite Construction Prior to Concrete Placement			1705.2.1			AISC 360 Table N6.1
i. Placement and installation	X		1705.2.1	☐		AISC 360 Table N6.1

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
of steel deck.						
ii. Placement and installation of steel headed stud anchors.	X		1705.2.1	☐		AISC 360 Table N6.1
iii. Document acceptance or rejection of steel elements	X		1705.2.1	☐		AISC 360 Table N6.1
2. Cold-Formed Steel Deck			1705.2.2	☒		
a. Inspection or Execution Tasks prior to Deck Placement			1705.2.2			SDI QA/QC Table 1.1
i. Verify compliance of materials (deck and all deck accessories) with construction documents, including profiles, material properties, and base metal thickness.	X		1705.2.2	☒		SDI QA/QC Table 1.1
ii. Document acceptance or rejection of deck and deck accessories.	X		1705.2.2	☒		SDI QA/QC Table 1.1
b. Inspection or Execution Tasks after Deck Placement						SDI QA/QC Table 1.2
i. Verify compliance of deck and all deck accessories installation with construction documents.	X		1705.2.2	☒		SDI QA/QC Table 1.2
ii. Verify deck materials are represented by the mill certifications that comply with the construction documents.	X		1705.2.2	☒		SDI QA/QC Table 1.2
iii. Document acceptance or rejection of installation of deck and deck accessories.	X		1705.2.2	☒		SDI QA/QC Table 1.2
c. Inspection or Execution Tasks Prior to Welding			1705.2.2			SDI QA/QC Table 1.3
i. Welding Procedure Specifications (WPS) available.		X	1705.2.2	☒		SDI QA/QC Table 1.3
ii. Manufacturer certifications for welding consumables available		X	1705.2.2	☒		SDI QA/QC Table 1.3
iii. Material identification (type/grade).		X	1705.2.2	☒		SDI QA/QC Table 1.3
iv. Check welding equipment.		X	1705.2.2	☒		SDI QA/QC Table 1.3
d. Inspection or Execution Tasks during Welding			1705.2.2			SDI QA/QC Table 1.4
i. Use of qualified welders.		X	1705.2.2	☒		SDI QA/QC Table 1.4
ii. Control and handling of		X	1705.2.2	☒		SDI QA/QC Table 1.4

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
welding consumables.						
iii. Environmental conditions (wind speed, moisture, temperature).		X	1705.2.2	☒		SDI QA/QC Table 1.4
iv. Verify WPS followed.		X	1705.2.2	☒		SDI QA/QC Table 1.4
e. Inspection or Execution Tasks after Welding			1705.2.2			SDI QA/QC Table 1.5
i. Verify size and location of welds, including support, sidelap, and perimeter welds.	X		1705.2.2	☒		SDI QA/QC Table 1.5
ii. Welds meet visual acceptance criteria.	X		1705.2.2	☒		SDI QA/QC Table 1.5
iii. Verify repair activities.	X		1705.2.2	☒		SDI QA/QC Table 1.5
iv. Document acceptance or rejection of welds.	X		1705.2.2	☒		SDI QA/QC Table 1.5
f. Inspection or Execution Tasks prior to Mechanical Fastening			1705.2.2			SDI QA/QC Table 1.6
i. Manufacturer installation instructions available for mechanical fasteners.		X	1705.2.2	☒		SDI QA/QC Table 1.6
ii. Proper tools available for fastener installation.		X	1705.2.2	☒		SDI QA/QC Table 1.6
iii. Proper storage for mechanical fasteners.		X	1705.2.2	☒		SDI QA/QC Table 1.6
g. Inspection or Execution Tasks during Mechanical Fastening			1705.2.2			SDI QA/QC Table 1.7
i. Fasteners are positioned as required.		X	1705.2.2	☒		SDI QA/QC Table 1.7
ii. Fasteners are installed in accordance with manufacturer's instructions.		X	1705.2.2	☒		SDI QA/QC Table 1.7
h. Inspection or Execution Tasks after Mechanical Fastening			1705.2.2			SDI QA/QC Table 1.8
i. Check spacing, type, and installation of support fasteners.	X		1705.2.2	☒		SDI QA/QC Table 1.8
ii. Check spacing, type, and installation of sidelap fasteners.	X		1705.2.2	☒		SDI QA/QC Table 1.8
iii. Check spacing, type, and installation of perimeter fasteners.	X		1705.2.2	☒		SDI QA/QC Table 1.8
iv. Verify repair activities.	X		1705.2.2	☒		SDI QA/QC Table 1.8
v. Document acceptance or rejection of mechanical fasteners.	X		1705.2.2	☒		SDI QA/QC Table 1.8

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
3. Open-Web Steel Joists and Joist Girders			1705.2.3			
a. Installation of open-web steel joists and joist girders			Table 1705.2.3	☒		
i. End connections – welded or bolted.		X	Table 1705.2.3	☒		SJI Specifications listed in Section 2207.1.
ii. Bridging – Horizontal or diagonal.			Table 1705.2.3			
a. Standard bridging.		X	Table 1705.2.3	☒		SJI Specifications listed in Section 2207.1.
b. Bridging that differs from the SJI specifications listed in Section 2207.1		X	Table 1705.2.3	☒		
4. Cold-Formed Steel Trusses spanning 60 feet or Greater		X	1705.2.4	☒	Trusses are not spanning 60 feet or greater, inspections to be completed as described in the commentary/notes	The Special Inspector shall verify that the temporary restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.
C. Concrete Construction			1705.3			
1. Inspect reinforcement, including prestressing tendons, and verify placement.		X	Table 1705.3	☒		ACI 318 Ch. 20, 25.2, 25.3, 26.6.1-26.6.3 IBC 1908.4
2 Reinforcing Bar Welding:			Table 1705.3 1705.3.1			AWS D1.4, ACI 318: 26.6.4
a. Verify weldability of reinforcing bars other than ASTM A706:		X	Table 1705.3	☐		AWS D1.4 ACI 318: 26.6.4
b. Inspect single pass fillet welds, maximum 5/16"; and		X	Table 1705.3	☐		AWS D1.4 ACI 318: 26.6.4
c. Inspect all other welds	X		Table 1705.3	☐		AWS D1.4 ACI 318: 26.6.4
3. Inspect anchors cast in concrete.		X	Table 1705.3	☒		ACI 318: 17.8.2
4. Inspect anchors post-installed in hardened concrete members.		X	Table 1705.3	☒	Adhesive Anchors: Follow manufacturer's printed installations instructions. Verify that anchors/dowels used in structural applications are installed in accordance with the contract documents and manufacturer's instructions, including location, edge distance & spacing, anchor type and size, embedment, hole cleaning procedures, drilling methods, & installation	

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
					procedures.	
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	X		Table 1705.3	☒	Perform tension testing on anchors/dowels used in structural applications. Manufacturer's rep to observe initial testing of each different type of anchor used and advise contractor of proper procedures. Minimum frequency of tension testing shall be as follows, unless less testing is approved by the SER based on satisfactory results of prior tests of similar anchors: -Rebar dowels: 5% -Expansion anchors: 10% -Adhesive anchors: 10% If any anchor fails testing, notify the SER & test all anchors of same type, installed by same trade, until (20) consecutive anchors pass, then resume initial test frequency.	ACI 318: 17.8.2.4
b. Mechanical anchors and adhesive anchors not defined in item 4a.		X	Table 1705.3	☒	Prior to proof loading wedge & sleeve anchors, perform torque test to ensure that anchor has been seated properly.	ACI 318: 17.8.2
5. Verify use of required design mix		X	Table 1705.3	☒		ACI 318: Ch. 19, 26.4.3, 26.4.4 IBC 1904.1, 1904.2, 1908.2, 1908.3
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of concrete.	X		Table 1705.3	☒		ASTM C172, ASTM C31; ACI 318: 26.4, 26.12; IBC 1908.10
7. Inspect concrete and shotcrete placement for proper application techniques.	X		Table 1705.3	☒		ACI 318: 26.5; IBC 1908.6, 1908.7, 1908.8
8. Verify maintenance of specified curing temperature and techniques.		X	Table 1705.3	☒		ACI 318: 26.5.3-26.5.5 IBC: 1908.9
9. Inspect Prestressed concrete for:			Table 1705.3	☐		
a. Application of	X		Table 1705.3	☐		ACI 318: 26.10

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
prestressing forces; and						
b. Grouting of bonded prestressing tendons	X		Table 1705.3	☐		ACI 318: 26.10
10. Inspect erection of precast concrete members		X	Table 1705.3	☐		ACI 318: Ch. 26.8
11. Verify in-situ concrete strength, prior to stressing tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.		X	Table 1705.3	☐		ACI 318: 26.11.2
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.		X	Table 1705.3	☒		
D. Masonry Construction (Check LA, LB or LC below) ☐ LA = Level A Quality Assurance ☒ LB = Level B Quality Assurance ☐ LC = Level C Quality Assurance			1705.4			TMS 402/ACI530/ASCE5 TMS 602/ACI530.1/ASCE6
Level A Quality Assurance: Minimum Verification						
A1. Prior to construction, verify certificates of compliance used in masonry construction.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.1
Level B Quality Assurance: Minimum Special Inspections						
B1. Verify Compliance with approved submittals.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B2: As masonry construction begins, verify that the following are in compliance:				☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2a: Proportions of site-prepared mortar.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B2b: Construction of Mortar Joints.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B2c: Grade and size of prestressing tendons and anchorage.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2d: Location of		X		☒		TMS 402/ACI530/ASCE5

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
reinforcement, connectors, and prestressing tendons and anchorage.						Table 3.1.2
B2e: Prestressing technique.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2f: Properties of thin bed mortar for AAC masonry.	X	X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2 Continuous inspection required for the first 5000sf of AAC Masonry, Periodic inspection is required after the first 5000sf of AAC masonry.
B3. Prior to grouting, verify that the following are in compliance:		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B3a: Grout space.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B3b: Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorage.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B3c: Placement of reinforcement, connectors, and prestressing tendons and anchorage.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B3d: Proportions of site-prepared grout for bonded tendons.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B3e: Construction of mortar joints.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4: Verify during construction:		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4a: Size and location of structural elements.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B4b: Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B4c: Welding of reinforcement.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4d: Preparation, construction, and protection of masonry during cold weather (temperature below 40dF) or hot weather (temperature above 90dF)		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B4e: Application and measurement of prestressing	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.2

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
force.						
B4f: Placement of grout and prestressing grout for bonded tendons is in compliance.	X			☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B4g: Placement of AAC masonry units and construction of thin-bed mortar joints.	X	X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2 Continuous inspection required for the first 5000sf of AAC Masonry, Periodic inspection is required after the first 5000sf of AAC masonry.
B5: Observe preparation of grout specimens, mortar specimens, and/or prisms.		X		☒		TMS 402/ACI530/ASCE5 Table 3.1.2
Minimum Tests						
B6: Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site in accordance with Specification Article 1.5B1.b.3 for self-consolidating grout.				☒		TMS 402/ACI530/ASCE5 Table 3.1.2
B7: Verification of f”m and f”aac in accordance with Specification Article 1.4B prior to construction, except where specifically exempted by this Code.				☒		TMS 402/ACI530/ASCE5 Table 3.1.2
Level C Quality Assurance: Minimum Special Inspections						
C1. Verify compliance with the approved submittals.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2. Verify that the following are in compliance:				☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2a. Proportions of site mixed mortar, grout and prestressing grout for bonded tendons.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2b. Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorages.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2c. Placement of masonry units and construction of mortar joints.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2d. Placement of reinforcement, connectors, and prestressing tendons and anchorages.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
C2e. Grout spacing prior to grouting.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2f. Placement of grout and prestressing grout for bonded tendons.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2g. Size and location of structural elements.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2h. Type, size, and location of anchors including other details of anchorage of masonry to structural members, frames, or other construction.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2i. Welding of reinforcement.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2j. Preparation, construction, and protection of masonry during cold weather (temperature below 40dF) or hot weather (temperature above 90dF).		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2k. Application and measurement of prestressing force.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2l. Placement of AAC masonry units and construction of thin-bed mortar joints.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2m. Properties of thin-bed mortar for AAC masonry.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C3. Observe preparation of grout specimens, mortar specimens, and/or prisms.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
Minimum Tests						
D1. Verification of f”m and f’AAC in accordance with Specification Article 1.4B prior to construction and for every 5,000sf during construction.				☐		TMS 402/ACI530/ASCE5 Table 3.1.3
D2. Verification of proportions of materials in premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout, as delivered to the project site.				☐		TMS 402/ACI530/ASCE5 Table 3.1.3
D3. Verification of Slump flow and Visual Stability Index (VSI) as delivered to				☐		TMS 402/ACI530/ASCE5 Table 3.1.3

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
the project site in accordance with Specification Article 1.5B.1.b.3 for self-consolidating grout.						
E. Wood Construction			1705.5			
1. High Load Diaphragms		X	1705.5.1	☐		
2. Metal Plate Connected Wood Trusses spanning 60 feet or Greater		X	1705.5.2	☐		
F. Soils			1705.6			
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.		X	Table 1705.6	☒		
2. Verify excavations are extended to a proper depth and have reached proper material.		X	Table 1705.6	☒		
3. Perform classification and testing of compacted fill materials.		X	Table 1705.6	☒		
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	X		Table 1705.6	☒		
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.		X	Table 1705.6	☒		
G. Driven Deep Foundations			1705.7			
1. Verify element materials, sizes and lengths, comply with the requirements.	X		Table 1705.7	☐		
2. Determine capacities of test elements and conduct additional load tests, as required.	X		Table 1705.7	☐		
3. Inspect driving operations and maintain complete and accurate records for each elements.	X		Table 1705.7	☐		
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve	X		Table 1705.7	☐		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
design capacity, record tip and butt elevations and document any damage to foundation element.						
5. For steel elements, perform additional special inspections in accordance with Section 1705.2.	-	-	Table 1705.7	☐		
6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3.	-	-	Table 1705.7	☐		
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge.	-	-	Table 1705.7	☐		
H. Cast-in-place Deep Foundations			1705.8			
1. Inspect drilling operations and maintain complete and accurate records for each element.	X		Table 1705.8	☐		
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes.	X		Table 1705.8	☐		
3. For concrete elements, perform tests and additional special inspections in accordance with Section 1705.3.	-	-	Table 1705.8	☐		
I. Helical Pile Foundations	X		1705.9			
J. Fabricated Items			1705.10 1704.2.5			Where fabrication of structural, load-bearing, or lateral load resisting members or assemblies is being conducted on the premises of a fabricators shop
1. Structural Steel		X		☐		
2. Steel Joists		X		☐		
3. Precast Concrete		X		☐		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
4. Wood Construction		X		☐		
K. Special Inspections for Wind Resistance			1705.11			RDP to identify the main windforce-resisting systems and wind-resisting components that are subject to special inspection per BCNYS Section 1704.3.3.
1. Structural Wood	X	X	1705.11.1	☐		
2. Cold Formed steel light framed Construction		X	1705.11.2	☐		
3. Wind-resisting Components		X	1705.11.3	☐		
L. Special Inspections for Seismic Resistance			1705.12			RDP to identify the designated seismic systems and seismic force-resisting systems that are subject to special inspection per BCNYS Section 1704.3.2.
1. Structural Steel		X	1705.12.1	☐		AISC 341 Section J
2. Structural Wood	X	X	1705.12.2	☐		
3. Cold Formed steel light framed Construction		X	1705.12.3	☐		
4. Designated seismic systems	X	X	1705.12.4	☐		ASCE 7 Section 13.2.2
5. Architectural Components		X	1705.12.5	☐		
6. Plumbing, Mechanical, and Electrical Components		X	1705.12.6	☐		
7. Storage Racks		X	1705.12.7	☐		
8. Seismic Isolation Systems		X	1705.12.8	☐		
9. Cold Formedsteel special bolted moment frames		X	1705.12.9	☐		
M. Testing for Seismic Resistance			1705.13			
1. Structural Steel		X	1705.13.1	☐		
2. Nonstructural Components		X	1705.13.2	☐		
3. Designated Seismic Systems		X	1705.13.3	☐		
4. Seismic Isolation Systems		X	1705.13.4	☐		
N. Sprayed Fire-Resistant Materials			1705.14			
1. Physical and visual tests		X	1705.14.1	☐		
2. Structural Member Surface Conditions		X	1705.14.2	☐		
3. Application		X	1705.14.3	☐		
4. Thickness		X	1705.14.4	☐		
5. Density		X	1705.14.5	☐		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
6. Bond Strength		X	1705.14.6	☐		
O. Mastic and Intumescent Fire-Resistant Coatings		X	1705.15	☒	Intumescent coatings over the fiber reinforcing	
P. Exterior Insulation and Finish Systems (EIFS)			1705.16			
1. Exterior Insulation and Finish Systems (EIFS)		X	1705.16	☒		
2. Water Resistive Barrier Coating		X	1705.16.1	☐		
Q. Fire-Resistant Penetration and Joints			1705.17			
1. Penetration Firestops		X	1705.17.1	☐		
2. Fire-resistant joint systems		X	1705.17.2	☐		
R. Testing for Smoke Contro			1705.18			
1. Testing Scope		X	1705.18.1	☐		
2. Qualifications		X	1705.18.2	☐		
S. Additional Special Inspections/Tests			The registered design professional of record shall identify if additional tests and inspection defined by BC Section 1705.1.1 are required and provide specific requirements below.			
1. Fiber Reinforced Polymer (FRP)	☒	☐		☒	In accordance with ACI 440.2R Chapter 7 and specification 030132 section 3.3.F.	
2.	☐	☐		☐		
3. Fiber Reinforced Polymer (FRP)	☒	☐		☒	Pull-off tests to verify bond strength, failure mode, and location	
4. Fiber Reinforced Polymer (FRP)	☒	☐		☒	Verify size and locations in conformance with documents and approved shop drawings	
5. Fiber Reinforced Polymer (FRP)	☒	☐		☒	Verify material properties including polyer, resins, primers, putties, sturants, adhesives, and coatings mixed for the day.	
6.	☐	☐		☐		
7.	☐	☐		☐		
8.	☐	☐		☐		
9.	☐	☐		☐		
10.	☐	☐		☐		

NOTES:

1. RDP to provide reference specification section detailing the requirements for inspections and/or tests and other clarifying notes, as necessary.
2. Commentary/Notes by DASNY are provided for information only and are not intended to provide complete details of the required tests and inspections. Refer to the Building Code of New York State for complete and detailed requirements.

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections:

1. Section 011200 – Contract Summary of Work, for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the Owner**,** the Design Professionals, occupants of the Project, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from the existing campus water system is available for use with metering and with payment of use charges. Sewer from the existing campus sewer system is available without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from the existing campus system is available for use with metering and with payment of use charges. Provide connections, metering, and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion and Sedimentation Control Plan: Show compliance with requirements of New York State Department of Environmental Conservation Stormwater General Permit or authorities having jurisdiction, whichever is more stringent.

C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage; including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

D. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of the work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air filtration system discharge.
4. Other dust-control measures.
5. Waste management plan.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations and requirements of authority having jurisdiction for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before the Owner's acceptance regardless of previously assigned responsibilities.

1.7 NOISE CONTROL

A. The Contractor shall control noise to as great extent as possible at all times.
B. Excessive noise producing activities should not occur during Campus Quiet Hours. Quiet hours on campus shall be from 10:00 PM to 8:00 AM seven days a week. Campus quiet hours are subject to change during campus exam periods (December 9 -19, 2019 and May 5 – 15, 2020) quiet time is 9:00 PM to 9:00 AM, and as further directed by

the college. The Contractor will adjust the construction quiet hours to accommodate the campus quite hours schedule.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 0.148-inch thick, galvanized steel, chain-link fabric fencing; minimum 8 feet high with galvanized steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch OD top and bottom rails. Corner, pull and gate posts shall be set in concrete, all other posts shall be driven into the ground. Provide blue and orange fabric mesh panels to match campus standards. Provide galvanized steel bases for supporting posts at fence sections that will be moveable.

B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.

C. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Contractor's Use Field Office: Of sufficient size to accommodate needs of Contractor's Site Supervisor and Project Manager.

C. Cleaning services for all rooms on a bi-weekly basis. Provide bathroom supplies Manager.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless the Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If the Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, the Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to campus system as directed by authorities having jurisdiction. Obtain all required permits.

C. Water Service: Connect to the Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to the Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will

not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems to maintain the facilities between 30 and 60% RH when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

G. Electric Power Service: Connect to the Owner's existing electric power service. Maintain equipment in a condition acceptable to the Owner. Obtain all required permits.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Install lighting for the Project identification sign.

I. Telephone Service: Provide temporary telephone service in Contractor's use facilities for use by all construction personnel. Install two telephone lines for the field office.

1. Provide additional telephone lines for the following:

a. Provide a dedicated telephone line for each facsimile machine in field office.

2. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Design Professional's office.
e. Testing Consultant's offices.
f. Owner's office.
g. Principal subcontractors' field and home offices.

3. Provide superintendent with cellular telephone for use when away from field office.

4. The campus will extend telephone service to field office locations for a charge of $50.00 per line. The campus will charge the contractor $20 monthly for each line.

J. Provide temporary internet service in Contractor's use facilities.
1. The campus will extend internet service to field office locations for a charge of $50.00 per line. The campus will charge the contractor $20 monthly for each line.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Substantial Completion inspection date is scheduled. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas specified in Individual Specification Sections.
3. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. Provide signage to redirect pedestrians as shown on Site Logistics Plan C-003.
4. No unloading of material may occur or obstruct campus roadways.

D. Parking: There will be no temporary parking areas for construction personnel on the project site. Parking permits for campus parking lots may be purchased for construction personnel for $20 annually.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain the Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding the Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as specified in the Contract Documents.
   a. The General Construction Contractor shall erect and maintain one plywood sign board approximately 8' x 8'. Posting of other signs at the project site are subject to the approval of the Owner and/or Architect. The Owner reserves the right to post such signs or notices as he deems proper. The project sign will be designed by the Architect and shall conform to the Architect's selection of colors, lettering style and size of lettering. The General Construction Contractor shall maintain the project sign in a secure, upright and visible position and shall provide for the sign's protection from dirt,

damage, loss, theft and vandalism. Signs damaged, lost or stolen shall be replaced at the General Construction Contractor's expense. The General Construction Contractor shall remove signs at the completion of the project when directed by the architect.

2. Temporary Signs: Provide other signs as required to inform public and individuals seeking entrance to the Project.

   a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste and recycling from construction operations. Comply with requirements of authorities having jurisdiction.

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Elevator Use: Use of elevators is not permitted.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

K. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

L. Maintain Existing Service to Adjacent Facilities: The nearby sewage pump building, site lighting, and site gate that are fed from the basement of Deyo Hall shall remain fully operational throughout the duration of the contract. The contractor shall coordinate the work to maintain its operation.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to authorities having jurisdiction.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from the project site during the course of the project.

4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations. See site staging plan for additional requirements.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to the Owner.

F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate the Fiber Hub Room from fumes and noise.

1. Construct dustproof partitions with fire rated gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
2. Where fire-resistance-rated temporary partitions are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
3. Insulate partitions to control noise transmission to occupied areas.
4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
5. Protect air-handling equipment.
6. Provide walk-off mats at each entrance through temporary partition.

K. Fire Safety During Construction: Comply with all requirements identified herein as well as the more stringent requirements of the applicable codes (New York State Building and Fire Codes.

1. No smoking: Smoking shall be prohibited throughout the project/construction site. "No Smoking" signs shall be conspicuously posted at all entrances and throughout the site.
2. The Contractor shall designate a Fire Prevention Program Superintendent/ Fire Safety Manager who shall be responsible for all fire safety efforts until completion and acceptance of the Work described in the Contract Documents that include but are not limited to the following:

    a. Prefire Plans. Develop in cooperation with the local Fire Chief and Fire Code Official. Any changes affecting the utilization of information contained in the plan shall result in notification to the local Fire Chief and Fire Code Official.
    b. Training. Job site personnel shall be trained in fire safety practices and procedures and the proper use of fire protection equipment, including hand-held fire extinguishers, hose lines, fire alarm and sprinkler systems.
    c. Fire Protection Devices. Fire protection and detection equipment shall be maintained and serviced.
    d. Hot Work Operations. Welding, cutting, open torches, torch-applied roof system activities, and other hot work operations shall be conducted under a permit system. A fire watch and fire extinguishers shall be provided.
    e. Impairment of Fire Protection Systems. Coordinate planned, emergency or accidental impairments of fire protection systems to include tagging of impaired systems and notification of Fire Department, Alarm Company, Building Owner/Operator, and Contractors.
    f. Temporary Covering of Fire Protection Devices. Coverings placed on or over fire protection devices for protection from damage shall be immediately removed upon the completion of the Work in the room or area in which the devices are installed.

3. Provide readily accessible telephone service for fire calls at a location or locations approved by the Owner.

    a. The Contractor shall pay all costs thereof until completion and acceptance of the Work or as otherwise directed by the Owner.
    b. Provide/post the street address of the construction site and the emergency telephone number of the Fire Department adjacent to the telephone.

4. Provide or maintain a Temporary or Permanent Standpipe system for Fire Department use in accordance with the following:

    a. Buildings subject to the New York State Building Code: In buildings that require a standpipe system, such standpipe shall be installed when the progress of construction reaches a height of 40 feet. The standpipe must be installed prior to the enclosure of the fourth floor addition.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.
6. **The existing roofing shall be removed in phases to allow for the steel erection and light gauge wall framing to occur prior to the enclosure while maintaining a water tight envelope for the existing building.**
7. **Temporary protection at the top of exterior wall and roof patching are required to maintain the existing building as water tight until the new roof and walls are water tight.**

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings

over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to the Design Professional.

c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves right to take possession of the Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 – Contract Closeout Requirements.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections and Contractor's Submittal Schedule, apply to this section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in the Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:
   1. Section 012300 – Alternates, for products selected under an alternate.
   2. Section 013300 – Submittal Procedure, for product submittals.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work of the Contract and purchased new for the Project. The term "product" includes the terms "material," "equipment," and "system."

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Procurement Exemption Approval Product Specification: A specification in which a specific manufacturer's product is named including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes as a single source or sole source provider.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" from Article 5, Section 5.04 of the General Conditions.
2. Design Professional's Action: If necessary, the Design Professional will request additional information or documentation for evaluation within one week of receipt of a comparable product request. The Design Professional will notify the Contractor through the Owner of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 013300 - Submittal Procedure.
    b. Use product specified if the Design Professional does not issue a decision on use of a comparable product request within time allocated.

B. Procurement Exemption Approval Product Specification Submittal: Comply with requirements in Section 013300 - Submittal Procedure. Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If the Contractor is given option of selecting between two or more products for use on the Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, the Design Professional will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at the Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger the Project structure.
3. Store products that are subject to damage by the elements under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic protected from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to the Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for the Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Refer to individual specification sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 013300 – Submittal Procedure.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. The Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," the Design Professional will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Provide products that do not contain asbestos.

B. Product Selection Procedures:

1. Product: Where Specifications include a procurement exemption approval and name a single source, sole source, manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for the Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications include a procurement exemption approval and name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for the Contractor's convenience will not be considered.
3. Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

C. Visual Matching Specification: Where Specifications require "match sample", provide a product that complies with requirements and matches sample. The Owner's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's full range", select a product that complies with requirements. The Design Professional will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: The Design Professional will consider the Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, the Design Professional may return requests without action, except to record noncompliance with these requirements:

1. Action Submittal shall be provided in accordance with Submittal Procedures within 90 days after Notice to Proceed.

2. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
3. Detailed comparison of qualities of proposed product with those named in the Specifications, including attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
4. Evidence that proposed product provides specified warranty.
5. List of similar installations for completed projects with project names and addresses and names and addresses of design professionals and owners, if requested.
6. Samples of all requested comparable products are required.
    a. Submit product data, shop drawings, samples, test reports, cost savings and in the case of lighting, photometry at the time of original submittal.
        1) Incomplete submittals will be returned as Not Reviewed.

B. Comparable Products Costs: Any costs savings to an approved Comparable Product identified and realized by the Contractor shall be shared equal between the Owner (50%) and Contractor (50%).

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Responsibility: The Contractor is responsible for the cutting and patching to permit installation or performance of Work of their contract.

C. Related Sections include the following:

1. Individual Specification Sections.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of Work of the contract.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of Work of the contract.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: At each occurrence, describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Design Professional's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.

C. Fire Rated Elements: Do not cut and patch fire rated elements (i.e. floors, walls, roofs, shafts, etc.) in a manner that results in reducing their capacity to perform as intended or that results in decreased fire rating.

D. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

E. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Design Professional's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

F. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including other trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials, unless specified otherwise in other Sections.

C. Fire Rated Elements: Provide firestopping products/systems specified in system design listings by approved testing agencies that conform to the construction type, penetrating item, annular space requirements and fire rating involved in each separate assembly. Refer to applicable Individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting or patching to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
    a. The existing roofing shall be removed in phases to allow for the steel erection and light gauge wall framing to occur prior to the enclosure while maintaining a water tight envelope for the existing building.

b. Temporary protection at the top of exterior wall and roof patching are required to maintain the existing building as water tight until the new roof and walls are water tight.

6. Fire Rated Elements: Install firestopping systems to comply with applicable Individual Specification Sections and firestopping manufacturer's written installation instructions and published drawings for products and applications.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for Construction Waste Management (CWM), with criteria for recycling and/or salvaging demolition and construction waste generated during the project. A Construction Waste Management Plan shall be developed for approval by the Construction Manager and DASNY Project Manager. The Plan shall be implemented throughout the duration of the project, and shall be documented in accordance with the SUBMITTALS Article below.

1. CWM is included as part of the LEED building goals for the project, which are established in alignment with the DASNY Sustainability Policy for Construction, and the project goals of the Owner.

B. Responsible parties:

1. Locations for removal bins or dumpsters shall be coordinated with DASNY's Project Manager.
2. Each contractor shall supply a CWM plan detailing the means and methods for recycling job site waste. Following the award of contract, the Contractors shall identify a single entity to act as the construction waste manager.
3. All Contractors will receive and sign-off on the CWM plan. They will be responsible for adherence to the plan through management of their work on-site and the waste generated under their contract.
   a. Sign-off and adherence to the plan applies even when a separate bid package is established for the CWM.

C. Resources

1. NY CD Resource Center
   727 East Washington Street
   Syracuse, New York 13210
   Bgriffin@syracusecoe.org (315) 443-9747

   Initiated with support from Empire State Development, The NY CD Resource Center supports and promotes the growth of C&D recycling and building materials reuse (BMR) in New York State through a variety of market-development and network-building activities. Key among these activities is the provision of C&D materials management training to New York contractors and haulers, many of whom want to increase recycling at construction sites but need help getting started. The program also offers on-site assistance at construction sites.

2. ESD Recycling Market Information Database.
   http://appcenter.nylovesbiz.com/esdrecycling/.

1.2 PERFORMANCE REQUIREMENTS

A. Each Contract shall prepare and submit a CWM Plan to the Design Professional for approval. The CWM Plan shall outline the provisions to be implemented to salvage for reuse or to recycle demolition and construction waste generated during the project.
   1. The end-of-project recycling rate when possible shall equal, at minimum, 75 percent for 2 LEED credits (by weight) of the total waste from construction, demolition, and land clearing activities.
      a. Contractors are encouraged to achieve higher levels of diversion from landfill if possible, as this benefits long-term landfill management and the LEED rating system awards additional points if exemplary performance levels are reached.

B. The approved CWM Plan shall be implemented throughout the duration of the project and documented in accordance with the SUBMITTALS Article below.

C. The CWM Plan shall include, but not be limited to, the following components:

   1. Re-Used materials/equipment: Materials or equipment to be removed from the site or turned over to the State shall be documented.
      a. Documentation shall include the materials turned over, weight or quantity of materials/equipment and a letter on company letterhead indicating the intended use of items.

   2. Listing of Targeted Materials: Develop a list of the waste materials from the Project that will be targeted for reuse, salvage, or recycling. The following materials shall be accounted for (materials that will not be recycled shall be indicated as such):
      a. Cardboard, paper, packaging
      b. Acoustical Ceiling Tiles
      c. Clean dimensional wood, palette wood
      d. Beverage containers
      e. Land clearing debris
      f. Concrete
      g. Stone
      h. Concrete Masonry Units (CMU)
      i. Asphalt
      j. Metals from banding, stud trim, ductwork, piping, rebar, roofing, windows, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze
      k. Gypsum board
      l. Carpet and pad
      m. Paint

n. Asphalt roofing shingles if applicable for any existing building demolition
o. Rigid Foam
p. Glass
q. Plastics
r. Woods

3. Sorting Method: Provide a description of the proposed means of sorting and transporting the recyclable materials (whether materials will be on-site sorted and then hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site for off-site sorting).
4. Recycling facilities: Provide the name of the recycling facilities(s) where materials will be sent for recycling, how it will be recycled, and the applicable fee(s).
5. Landfill Information: Provide the name of the landfill(s) where trash will be disposed of and the applicable landfill tipping fee(s).
6. Additional Information: Include any additional information deemed relevant to describe the scope and intent of the CWM Plan to the Design Professional.
7. Subcontractor Requirements: Construction Waste Management and recycling requirements shall be incorporated into all Subcontractors' contracts.

1.3 SUBMITTALS

A. Submittal Requirements:
1. A copy of the CWM Plan, as defined in the PERFORMANCE REQUIREMENTS Article above.
2. Contractors shall submit a monthly Waste Management submission.
a. This submission shall include waste receipts and a completed Waste Management Form. (a sample form is included at the end of this Section identified as Exhibit "A")
3. Calculations and supporting documentation to demonstrate end-of–project recycling rates meeting the requirements of the CWM Plan. Note: These calculations and supporting documentation are required regardless of method of processing (on-site or off-site separations). Use these Solid Waste Conversion Factors only if tipping tickets are not available if the weight in each dumpster or container is not directly measured.

Solid Weight Conversion Factors	
Mixed Waste	350 lbs/cubic yard
Wood	300 lbs/cubic yard
Cardboard	100 lbs/cubic yard
Gypsum Board	500 lbs/cubic yard
Rubble	1,400 lbs/cubic yard
Steel	1,000 lbs/cubic yard

b. Record and document the total weight (in tons) of all demolition and construction waste materials sent to the

landfill, or recycled or salvaged. Monthly Waste Management Reporting Forms shall be used as the basis for determining the total amount of waste recycled or salvaged for the project. The monthly reporting forms shall specify:

1) The number of dumpsters or other containers of recycled or salvaged materials for that month.
2) The volume (in cubic yards) of each dumpster or container of recycled or salvaged materials for that month.
3) The type of recycled or salvaged material contained in each dumpster or container.
4) The weight of the recycled or salvaged material in each dumpster or container. For materials not contained in the Solid Waste Conversion Factors above propose a conversion factor for review by the Design Professional.
5) In addition, provide the name of the receiving facilities/companies that will be purchasing or accepting the recycled or salvaged materials. Receipts or other proof of facility reception of materials is required.
6) For materials separated for recycling off-site, establish a method for tracking the weight of the recycled material. The method shall be included in the CWM Plan for the Design Professional review and approval.

c. In the case of off-site separation, ensure the transfer station used will provide tickets with required information on delivery weights (or volume with appropriate conversions), and proof of recycling rates for reporting.

d. Calculate the end-of-project recycling rate percentage by dividing the recycled and salvaged waste (in tons) by the total waste generated (recycled, salvaged, and landfilled waste – also in tons), and multiplying by 100.

e. For materials turned over to others for reuse, provide documentation on company letterhead indicating the material(s), the quantity (either by weight or units), the date and the intended reuse of the product.

PART 3 - EXECUTION

3.1 IMPLEMENTATION

The following implementations of the CWM Plan will be the responsibility of either the Contractor for the Construction Work or the CWM Contractor if that work is bid out under separate contract.

A. Containers: Provide containers and the removal of all waste, non-returned surplus materials, and rubbish from the site in accordance with the Waste Management Plan. Oversee and document the

results of the Plan. The Prime Contractors shall be responsible for collecting, sorting, and depositing in designated areas, their waste, non-returned surplus materials, and rubbish, as per the CWM Plan.

B. Instruction: Provide on-site instruction of appropriate separation, handling and recycling, salvage, reuse and return methods to be used by all parties in appropriate stages of the Project.

C. Separation of materials: Recycling and waste bin areas are to be kept neat and clean, and clearly marked.
   1 On-site separation: Lay out a specific area(s) to facilitate separation of materials for potential recycling, salvage, reuse and return. Each potential material shall be collected and stored to avoid being mixed with other materials
   2. Off-site separation: Lay out an area for collection of mingled recyclable and waste materials, to be picked up and sorted off-site for recycling.

3.2 MEETINGS

A. Conduct Construction Waste Management meetings. Meetings shall include Subcontractors affected by the CWM Plan. At a minimum, waste management goals and issues shall be discussed at the following meetings:
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.

B. Any non-compliant practices in the field will be addressed at regular job-site meetings.

3.3 MONTHLY WASTE MANAGEMENT REPORTING FORMS

A. Monthly Waste Management Reporting Forms, as required in the SUBMITTALS Article above, shall be submitted to the Design Professional for review throughout the duration of the project.

END OF SECTION

(Project Name) (Exhibit "A")
CONTRACTOR C&D WASTE MANAGEMENT FORM
For Waste Generated On-Site

Company: _____

Contact: _____

Phone: _____

Material Description (Include packaging waste if applicable)	**Total Weight**	**% Reused on-site**	**% Recycled off-site**	**% Sent to landfill**	**Material Recipient**

Recycled Material: Material that would otherwise be destined for landfill but is diverted from the waste stream, reintroduced as material feedstock and reprocessed into new end products.

Reused Material: Materials that can be reused in their original form without any reprocessing.

SECTION 017800
CONTRACT CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections and Notice of Substantial Completion (NOSC) Form, apply to this section.

1.2 SUMMARY

A. Section includes administrative requirements for preparation and submission of final Contract Closeout Documents, including, but not limited to, the following:

1. Contract Closeout Meeting
2. Notice of Substantial Completion (NOSC) Requirements
    a. List of Incomplete Work Items
    b. Contract Turnover Documents
        1) As-built Drawings
        2) As-built Specifications
        3) As-built Schedule
        4) Sustainable Documents
        5) Permits, Licenses and Certificates
        6) Hazardous Wastes Documents
        7) Commissioning Authority's Deficiency Log
        8) NYSERDA or Utility Company Rebate program Submission Documents
    c. General Guarantee
    d. Operation and Maintenance Manuals
3. Contract Closeout
4. Final Cleaning

B. Related Sections:

1. General Conditions, Article 8 – Payment
2. General Conditions, Article 13 – Inspection and Acceptance
3. Section 014000 – Quality and Code Requirements
4. Section 017823 – Operation and Maintenance Manuals
5. Section 017839 – As-built Documents
6. Section 018113 – Sustainable Design Requirements

1.3 CONTRACT CLOSEOUT MEETING

A. Contract Closeout Meeting: The Owner will schedule and conduct a Contract closeout meeting, at a time convenient to the Owner and Design Professional, but no later than sixty (60) days prior to the scheduled inspection date for Substantial Completion.

1. The Owner will conduct the meeting to review requirements and responsibilities related to Contract closeout.
2. Attendees: Representatives of the Owner, testing agency, commissioning authority, Design Professional**,** and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to make binding decisions on matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Contract closeout, including the following:

    a. Status of Contract Turnover Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Requirements for preparing sustainable documentation.
    d. Requirements for submitting final operation and maintenance manual.
    e. Requirements for Permits, Licenses and Certificates.
    f. Preparation of Contractor's list of incomplete Work items.
    g. Procedures for processing Application for Payment at Substantial Completion and final payment.
    h. Submittal procedure.
    i. Installation of the Owner's furniture, fixtures, and equipment.
    j. Responsibility for removing temporary facilities and controls.

4. Minutes: The Owner or Design Professional will record and distribute meeting minutes.

1.4 NOTICE OF SUBSTANTIAL COMPLETION (NOSC)

A. Substantial Completion: After the Work of the Contract is determined by the Owner, to be at Substantial Completion, the Contractor shall submit a written request to the Owner for a date of inspection. The date of Substantial Completion establishes the start of the guarantee period.

B. Documentation: The Notice of Substantial Completion (NOSC) form shall be executed at the end of inspection documenting incomplete Work items and submission of documents in accordance with this section that includes but is not limited to:

    a. Preparation of a list of Work to be completed and corrected, the value of Work items on the list, and completion date of each Work item.
    b. Submittal of contract turnover documents.
    c. Submittal of operation and maintenance manuals, testing, adjustment and balance records.
    d. Delivery of tools, spare parts, extra materials, and similar items to location designated by the Owner. Label with manufacturer's name and model number where applicable.
    e. Make final changeover of permanent locks and deliver keys to the Owner. Advise the Owner of changeover.
    f. Termination and removal of temporary facilities from Project site, along with mockups, construction tools, and similar elements.
    g. Completion of final cleaning requirements.

C. SAMPLE FORM - NOTICE OF SUBSTANTIAL COMPLETION

DORMITORY AUTHORITY – STATE OF NEW YORK

NOTICE OF SUBSTANTIAL COMPLETION

INSTITUTION:		CONTRACTOR:	
PROJECT TITLE:		CONTRACT NO:	
PROJECT NO:	9999	CONTRACT VALUE:	

With exception of the list of incomplete Work and status of Contract Turnover Documents, the Dormitory Authority accepts the Work of the Contract Documents as Substantial Completion on (date) _____, in accordance with the General Conditions. This date also constitutes start of the guarantee period.

ITEM	LIST OF INCOMPLETE WORK	SCHEDULED COMPLETION DATE
1.		
2.		
3.		
4.		
5.		
6.		

NOTE: Attach additional pages if necessary.

STATUS of CONTRACT TURNOVER DOCUMENTS:	PROVIDED YES	DUE DATE	Not Applicable
• As-built drawings & specifications transmitted to Design Professional	☐		☐
• Certified As-built schedule transmitted to Owner	☐		☐
• Sustainable documentation submitted to Owner	☐		☐
• Permits, licenses and certificates submitted to Authority having jurisdiction	☐		☐
• Hazard waste documentation approved by Owner	☐		☐
• Operation and maintenance manual submitted to Owner in final form	☐		☐
• Spare products stock stored on site per Owner's direction	☐		☐
• Identify any other Contract specific turnover document	☐		☐
• Identify any other Contract specific turnover document	☐		☐
• Final cleaning	☐		☐

Acknowledged by the Contractor (signature& title)	Email Address	Date
Recommended by the Design Professional (signature & title)	Email Address	Date
Recommended by the Project Manager (signature)		Date
Approved by the Director/Chief (signature)		Date

Distribution by PM:
Contractor
Design Professional
Facility Representative

Distribution by PA:
Code Compliance Unit
Risk Management
Procurement Contract File (original)

NOTICE OF SUBSTANTIAL COMPLETION
May '10

Page 1

1.5 LIST OF INCOMPLETE ITEMS

A. Organization of List: Submit list of incomplete items in *EXCEL* spreadsheet electronic format. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
2. Include the following information at the top of each page:

    a. Project name & number.
    b. Date.
    c. Name of Contractor & Contract number.
    d. Page number.

B. Reinspection: Submit a written request for reinspection. On receipt of request, the Owner will either proceed with inspection or notify the Contractor of unfulfilled requirements. After inspection, the Owner will notify the Contractor of items, either on the Contractor's list or additional items identified, that must be completed or corrected.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis to proceed with commencement of Contract Closeout Documents.

1.6 CONTRACT TURNOVER DOCUMENTS

A. Procedure: Contract turnover documents shall be transmitted to the Owner or if stated to the Design Professional, fifteen (15) days prior to requesting inspection date for Substantial Completion.

B. As-built Drawings: Transmit one paper copy set of marked-up As-built Drawings to the Design Professional, with copy of transmittal to Owner. Print each Drawing, whether or not changes and additional information were recorded.

C. As-built Specifications: Transmit one paper copy set of marked-up as-built specifications, including addenda and contract modifications to the Design Professional, with copy of transmittal to Owner.

D. As-built Schedule: Submit one electronic (PDF) copy, certified by the Contractor, of the schedule that reflects the exact manner in which the project was actually constructed, to the Owner.

E. Sustainable Documentation: Submit one electronic (PDF) copy of product data, costs, invoices, material lists, manifest, certifications, etc. to obtain project LEED certification. Refer to Individual Specification Section 018113 – Sustainable Design Requirements for record-keeping and submittals required for USGBC LEED prerequisites.

F. Permits, Licenses and Certificates Documents: Submit one copy of original permits, licenses, certifications, inspection reports, material certificates/affidavits, approvals,

and related documents required by authorities having jurisdiction to obtain Letter of Completion, Certificate of Occupancy, or Code Compliance Certificate. Coordinate and respond to requirements from the Owner, NYC Department of Buildings, or Municipality and all other authorities having jurisdiction for issuance of approval/documents required for the Owner use and occupancy.

1. Cooperate and help coordinate with agency testing materials as specified in Section 014000 – Quality and Code Requirements. Testing Agency is required to submit final report of special inspections.
2. The Contractor to provide one copy of original certification from agency or firm certifying the following and as required by Individual Specification Sections:

    a. Sprinkler System – NFPA Forms for;
        1) Contractor's Material and Test Certificate for Underground Piping
        2) Contractor's Material and Test Certificate for Aboveground Piping
    b. Fire Alarm System – NFPA 72 Form for;
        1) Record of Completion
    c. Elevator – Certification Form from;
        1) Qualified Elevator Inspector (QEI)
    d. Electrical – Certification Form from;
        1) Authority having jurisdiction
        2) Independent electrical inspection agency acceptable to the Owner

G. Hazardous Waste Documents: Submit four (4) paper copies of documents to the Owner thirty (30) days prior to requesting inspection date for Substantial Completion. Refer to Individual Specification Sections for all requirements.

H. Miscellaneous Record Submittals: Refer to Individual Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one electronic (PDF) copy of each submittal.

I. Reports: Submit written report indicating items incorporated in Contract Documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

1.7 GUARANTEE

A. General Guarantee: Comply with General Conditions, Article 13 – Inspection and Acceptance. The date established on the Notice of Substantial Completion form constitutes commencement of the Guarantee period.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Final Manuals Submittal: Submit an electronic copy of a compiled set of complete Operation and Maintenance Manuals in final form as indicated in Section 017823 – Operation and Maintenance Manuals, to the Owner fifteen (15) days prior to requesting date of inspection for Substantial Completion.

1.9 CONTRACT CLOSEOUT (same as final application for payment)

A. Contract Compliance: The Contractor shall comply with the requirements of General Conditions, Section 10.08 – Limitations on Actions.

B. Preliminary Procedure: All Work and Extra Work of the Contract and requirements of this section must be complete and approved prior to commencement of Contract closeout.

1. The Contractor shall request and submit to the Owner a final Contractor's Pencil Copy billing request that will formulate the final Application for Payment.
2. The Contractor shall provide outstanding documentation to the Owner in accordance with General Conditions, Article 20 – Opportunity Programs.

C. Procedures: Upon the Owner's approval of the Contractor's Pencil Copy billing request, Contract closeout documents will be provided to the Contractor. The Contractor shall complete each document and submit all documents with original signature & notary as indicated on forms, the following:

1. Final Application for Payment that includes remaining Retainage.
2. Final Compliance Report.
3. Contractor and Subcontractor Certifications Form.
4. Contractor's Certified Payroll Form.
5. Release Form -- Final Payment to Contractor.
6. Consent of Surety -- Final Payment to Contractor, with power of attorney.

D. Payroll Forms: The Contractor and all Sub-contractors to the Contractor shall submit original copies of the Contractor and Subcontractor Certifications Form and Contractor's Certified Payroll Form.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with allowable VOC levels.

PART 3 - EXECUTION

3.1 DEMOBILIZATION

A. Deliver tools, spare parts, extra materials, and similar items to location designated by the Owner. Label with manufacturer's name and model number where applicable.

B. Make final changeover of permanent locks and deliver keys to the Owner. Advise the Owner's personnel of changeover.

C. Terminate and remove temporary facilities from the Project site, along with mockups, construction tools, and similar elements.

3.2 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for contract turnover document purposes. Post changes and modifications to contract turnover documents as they occur; do not wait until the end of the Project.

B. Maintenance of Turnover Documents and Samples: Store turnover documents and Samples in the field office apart from the Contract Documents used for construction. Contract turnover documents shall not be used for construction purposes. Maintain turnover documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to contract turnover documents for the Owner's reference during normal working hours during performance of Contract.

3.3 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations as applies to Work of the contract.

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.

i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain. Replace if soil or stains remain after shampooing.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

    1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in all other applicable sections.

END OF SECTION 017800

SECTION 017823 - OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections and Contractor's Submission Schedule, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance manual for systems, subsystems, and equipment.
2. Product maintenance data.
3. Systems and equipment maintenance data.

B. Related Sections:
1. Section 013300 – Submittal Procedures
2. Section 017700 – Contract Closeout Requirements
3. Section 018113 – Sustainable Design Requirements
4. Section 019113 – General Commissioning Requirements

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Required Manuals: see Section 017700 – Contract Closeout Requirements for additional requirements.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to the Design Professional.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.

b. Enable inserted reviewer comments on draft submittals.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS

A. Organization: Organize the manual into separate sections by CSI number based on the table of contents of the project manual, for each system and subsystem, and a separate section for each piece of equipment not part of a system. The manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents:

   a. Operation data.
   b. Product maintenance data.
   c. Systems and equipment data

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Design Professional.
8. Name and contact information for Commissioning Agent.
9. Names and contact information for major consultants to the Design Professional that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one media volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents by CSI Section number and then by system, subsystem, and equipment.

E. Manuals, Electronic Copy: Submit electronic (PDF) copy of the manual, to the Design Professional, concurrent with Action Submittal.

2.2 OPERATION DATA

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Section and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Operating standards.
3. Operating procedures.
4. Operating logs.
5. Wiring diagrams.
6. Control diagrams.
7. Piped system diagrams.
8. Precautions against improper use.
9. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE DATA

A. Content: Organize data into a separate section, within the O & M Manual, for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in section identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Guarantees: Include copies of warranties and guarantees lists of circumstances and conditions that would affect validity of warranties.

1. Include procedures to follow and required notifications for warranty claims.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE DATA

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in a separate section within the O & M Manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and

telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation shall be provided for review, concurrent, with Action Submittal specified in Individual Specification Section.

1. Correct or modify the manual to comply with the Design Professional's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Design Professional's and Commissioning Authority's comments and prior to commencing demonstration and training.

B. Product Maintenance Data: Assemble a complete set of maintenance data, in a separate section, within the O & M Manual, indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Data: Assemble a complete set of operation and maintenance data, in a separate section, within the O & M Manual, indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate section within the O & M Manual, for each system and subsystem, in the form of an instructional manual for use by operating personnel.

D. Manufacturers' Data: Where manual contain manufacturers' standard printed data; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in As-built Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

END OF SECTION 017823

SECTION 017839 – AS BUILT DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for As-built documents, including the following:

1. As-built Drawings
2. As-built Specifications
3. As-built Schedule
4. Record Product Data
5. Miscellaneous record submittals

B. Related Sections:

1. Section 013200 – Construction Progress Documentation
2. Section 013300 – Submittal Procedure; Required Submittal List
3. Section 017700 – Contract Closeout Requirements
4. Section 017823 – Operation and Maintenance Manuals

C. Administrative and procedural requirements for contract turnover documents, including, but not limited to the following, as provided in Individual Specifications Sections.

1. Sustainable Documents
2. Commissioning Documents
3. Hazardous Waste Documents

1.3 CLOSEOUT SUBMITTALS

A. Required Documents: Section 017700 – Contract Closeout Requirements, describes administrative requirements for submission, number and type of copies required for contract closeout requirements.

PART 2 - PRODUCTS

2.1 AS-BUILT DRAWINGS

A. As-built Drawings: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings onsite. Review As-built Drawings and shop drawings monthly with the Owner, for approval.

1. Preparation: Daily mark As-built Drawings to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up As-built Drawings.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an acceptable drawing technique.
   c. Record data as soon as possible after obtaining it.
   d. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order.
   k. Changes made by Bulletin.
   l. Changes made following the Owner's written orders.
   m. Details not on the original Contract Drawings.
   n. Field records for variable and concealed conditions.
   o. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up as-built prints.
4. Mark as-built sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
7. Provide electronic copies of the As-Built drawings as part of the close our documentation. Paper copies will not be acceptable.

2.2 AS-BUILT SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders**,** record Product Data**,** and turnover Drawings where applicable.
6. Provide electronic copies of the As-Built specifications as part of the close our documentation. Paper copies will not be acceptable.

2.3 AS-BUILT SCHEDULE

A. Final Schedule: Submit to the Owner a final schedule update. The As-built Schedule shall reflect the exact manner in which the project was actually constructed including actual start and finish dates, activities, sequences and logic.

1. The Contractor shall certify the final schedule update as being a true reflection of the way the project was actually constructed.

2.4 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to the Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders**,** As-built Specifications, and As-built Drawings where applicable.
4. Provide electronic copies of the As-Built product date as part of the close our documentation. Paper copies will not be acceptable.

2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by Individual Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.
2. Provide electronic copies of the As-Built product date as part of the close our documentation. Paper copies will not be acceptable.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Maintain Change Log: Maintain and submit written change log to the Owner, monthly for review indicating items incorporated in contract turnover documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

B. Recording: Maintain one copy of each submittal during the construction period for contract turnover document purposes. Post changes and modifications to contract turnover documents as they occur; do not wait until the end of the Project.

C. Maintenance of Turnover Documents and Samples: Store turnover documents and Samples in the field office apart from the Contract Documents used for construction. Contract turnover documents are not to be used for construction purposes. Maintain turnover documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to contract turnover documents for the Owner's reference during normal working hours during performance of Contract.

END OF SECTION 017839

SECTION 018113 - SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings, LEED Checklist for the project, and Individual Specification Sections, apply to this Section.

B. State Executive Orders and laws related to sustainability, resiliency, and energy such as EO #88, EO #4, EO #166, the Community Risk and Resiliency Act, and related reporting requirements.

C. Owner goal documents and related required reporting information such as Campus Sustainability Plans, Operational Goals, Air Quality Goals, Waste Reduction Goals, and related reporting processes.

D. Specified as Work of the Contract Documents, this section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to be submitted for review for LEED certification. The goal of this project is to obtain LEED certification Silver based on the applicable LEED rating system.

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.

E. Related Sections:

1. Section 013300 – Submittal Procedure, for administrative procedures on submittals.
2. Individual Specification Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.2 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC accredited certification body.

B. LEED: Leadership in Energy & Environmental Design.

C. PHIUS – Passive House Institute U.S. – a performance based goal including blower door testing and on-site inspections for building envelope completeness.

D. Corporate Sustainability Reports (CSR): a third party report which includes environmental impacts of extraction operations and activities associated with the manufacture's product and the product supply chain. Acceptable CSR frameworks include:
   1. Global Reporting Initiative Sustainably Report
   2. Organization of Economic Co-operation and Development Guidelines for Multinational; Enterprises.
   3. U. M. Global Compact: A Communications Process
   4. ISO 26000: 2010 Guidance on social responsibility

E. Environmental Product Declaration (EPD): a standardized way of quantifying the environmental impact of a product or system. An EPD is created and verified in accordance with the International Standard ISO 14025, developed by the International Organization for Standardization (ISO) May be a documentation requirement for MR Credits.

F. Health Product Declaration (HPD): The Health Product Declaration ™ (HPD) provides a standardized way of reporting the material contents of building products, and the health effects associated with these materials. May be a documentation requirement for MR Credits.

G. Extended Producer Responsibility: Products purchased from a manufacturer (producer) that participates in and extended producer responsibility program or is directly responsible for extended producer responsibility. Valued at 50% of their cost for purposes of credit achievement calculations related to MR credit

H. Bio-Based materials: Bio-based products must meet the Sustainable Agriculture Networks' Sustainable Agriculture Standard. Materials must be tested using ASTM Test Method D6866 and be legally harvested. Excluding hide products such as leather. Valued at 100% of their cost for purposes of credit achievement calculations related to MR credit.

I. Wood products: Wood products must be certified by the Forest Stewardship Council or USGBC approved equivalent. Valued at 100% of their cost for purposes of credit achievement calculations related to MR credit.

J. Materials Reuse: reuse includes salvaged, refurbished, or reused products. Valued at 100% of their cost for purposes of credit achievement calculations related to MR credit.

K. Recycled Content: Recycled Content is the sum of the post-consumer recycled content plus one-half the pre-consumer recycled content, based on cost. Valued at 100% of their cost for purposes of credit achievement calculations related to MR credit.

   1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
   2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
   3. Note: Mechanical, Electrical and Plumbing components are specialties not included in the recycled content calculations.

1.3 SUBMITTALS

A. General: Submit additional LEED submittals when called for to comply with Section 013300 – Submittal Procedure.

B. LEED submittals may be asked for in addition to other submittals. If submittal item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements. Submittals may be in electronic format to facilitate on-line tracking and documentation of LEED credits.

C. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs excluding labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Furniture.
2. Plumbing.
3. Mechanical.
4. Electrical.
5. Specialty items such as elevators and equipment.
6. Wood-based construction materials.

LEED Action Plans: Provide preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met:

1. Prerequisite MR 2: Provide a Construction Waste Management plan: Refer to Specification Section 017419 CWM for details.
2. Credit MR 1: Materials information: List of proposed reused materials - Identify each material that will be salvaged or refurbished, including its source, cost, and replacement cost if the item was to be purchased new.
3. Credit MR2: List of proposed materials with Environmental Product Declarations or that meet the requirements of multi-attribute optimization.
4. Credit MR 3: List products that can provide documentation to demonstrate environmental impacts of extraction and operations and activities associated with the product and supply chain.
5. MR Credit 4: List of proposed products for which material ingredients are available to demonstrate improved life-cycle impacts.
6. Credit EQ 3: Construction Indoor-Air-Quality Management plan.

D. LEED Progress Reports: Submit monthly reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. Prerequisite MR 2: CWM progress reports including waste tickets from landfill and recycling providers.
2. Credit MR 2: Environmental product declarations contributions.
3. Credit MR 3: Sourced raw materials percentages.
4. Credit MR 4: Materials ingredients percentages.
5. Credit EQ 2: Low Emitting Materials percentages.
6. Credit EQ 3: Construction indoor air quality management plan.

E. LEED Documentation Submittals:

1. LEED Progress Reports: Submit monthly reports comparing actual construction and purchasing activities with LEED action plans for the following:

2. Credit WE 2: Product Data for plumbing fixtures and faucets indicating compliance with the water efficiency requirements of the specified fixtures.
3. Prerequisite MR 2: CWM progress reports including waste tickets from landfill and recycling providers.

4. Credit MR 2: Environmental product declarations for installed products or product data with third party certificates demonstrating impact reduction below industry average.
5. Credit MR 3: Product data on products with publicly released a report or third party report from their raw materials suppliers meeting LEED descriptions OR product data for materials to meet a goal of 25% by cost of the total value of permanently installed materials that meet one of the following categories:
   a. Extended Producer Responsibility
   b. Bio-based Materials
   c. Certified Wood
   d. Material Reuse
   e. Recycled content
6. Credit MR 4: Product data on products for which material ingredients are available to demonstrate improved life-cycle impacts.
7. Credit EQ 3: Indoor Air Quality Management - During Construction.

   a. Construction indoor-air-quality management plan.
   b. Product data for temporary filtration media.
   c. Product data for filtration media used during occupancy.
   d. Documentation of tobacco use restrictions during construction.
   e. Construction Documentation: Six photographs each at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

8. Indoor Air Quality Assessment - Before Occupancy:

   a. Describe the building air flush-out procedures including the dates when flush-out was begun and completed, relation to occupied status, and completed and statement that filtration media was replaced after flush-out.
   b. Product data for filtration media used during flush-out and during occupancy.
   c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.
   d. Or provision of Air Testing and report of results, as well as remediation processes if testing levels do not meet acceptable levels of indoor air quality.

1.4 QUALITY ASSURANCE

A. Documentation to the USGBC:
   1. The Contractor shall track and document all LEED submittals required to be submitted to the USGBC and uploaded LEED online for the LEED Certification.

B. LEED Coordinator: Designate, from the construction team, an experienced LEED-Accredited Professional to coordinate LEED requirements and facilitate submission of documentation to LEED-online. . Indicate if a LEED Coordinator is engaged from outside of the team. The LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

PART 3 - PRODUCTS

3.1 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

A. Credit MR2: Provide at least 20 different permanently installed building products from at least five different manufacturers that have Environmental product declarations OR provide materials to meet a goal of 50% by cost of the total value of permanently installed materials that have third party certificates that demonstrate impact reduction below industry average in at least three of the following categories are valued at 100% of their cost for credit achievement calculations:
   1. Global Warming potential (greenhouse gases) in Co2e
   2. Depletion of the stratospheric ozone layer, in kgCFC-11
   3. Acidifications of land and water sources, in mole H+ or kg SO2
   4. Eutrophication, in kg nitrogen or kg phosphate
   5. Formation of tropospheric ozone, in kg NOx or kg ethane and depletion of nonrenewable energy resources in MJ
   6. USGBC approved program - Products that comply with other USGBC approved multi-attribute frameworks.

3.2 SOURCING OF RAW MATERIALS

A. Credit MR3: Provide at least 20 different permanently installed building products from at least five different manufacturers that have publicly released a report from their raw materials suppliers that document raw materials supplier extraction locations. A commitment to long-term ecologically responsible land use and a commitment to reducing environmental harms from extraction and/or manufacturing processes and a commitment to meeting applicable standards or programs voluntarily that address responsible sourcing criteria.

OR

Provide materials to meet a goal of 25% by cost of the total value of permanently installed materials that meet one of the following:
   1. Extended Producer Responsibility
   2. Bio-Based Materials

3. Wood products certified by FSC or USGBC approved equivalent
4. Materials Reuse
5. Recycled Content
6. USGBC approved program meeting leadership extraction criteria

3.3 MATERIAL INGREDIENTS

A. Credit MR4: Provide at least 20 different permanently installed products from at least five different manufacturers that use one of the following programs to demonstrate the chemical inventory of the product to at least 0.1%
1. Manufactures Inventory
2. Health Product Declaration
3. Cradle to Cradle
4. USGBC approved program

OR
Provide products that document their material ingredient optimization using the path below for 25% by cost of their total value of permanently installed products in the project.
5. GREEN screen v1.2 Benchmark
6. Cradle to Cradle Certified
7. International Alternative Compliance Path – REACH optimization
8. USGBC approved program.

OR
Provide building products for least 25% by cost of the total value of permanently installed products in the project that are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs which at a minimum, document at least 99%(by weight) of the ingredients used to make the building or building materials and are sourced from manufactures which the independent third party varication of their supply chain.

PART 4 - EXECUTION

4.1 REFRIGERANT AND CLEAN-AGENT FIRE-EXTINGUISHING-AGENT REMOVAL

A. When specified as part of the Work of the Contract Documents, remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC based. Replace or adjust existing equipment to accommodate new refrigerant as described in Division 23 Sections.

B. When specified as part of the Work of the Contract Documents, remove clean-agent fire-extinguishing agents that contain HCFCs or halons and replace with agent that does not contain HCFCs or halons. See Division 21 Section "Clean-Agent Fire Extinguishing Systems" for additional requirements.

4.2 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Construction Waste Management and Disposal Plan.

4.3 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

B. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 - Temporary Facilities and Controls, installs filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.

C. Replace all air filters immediately prior to Substantial Completion with the specified permanent with Construction Indoor Air Quality Management plan.

D. Construction Indoor Air Quality Assessment - Before Occupancy:

1. Air-Quality Testing:

a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's current "LEED-D+C: Reference Guide."

b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

1) Formaldehyde: 27 ppb.
2) Particulates (PM10): 50 micrograms/cu. m. (Healthcare projects 20 micrograms/cu. m.
3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m. (Healthcare projects 200 micrograms/cu. m.
4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

c. Air-sample testing shall be conducted as follows:

1) All measurements shall be conducted prior to occupancy but during normal occupied hours and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles.
3) Number of sampling locations will vary depending on the size of building and number of ventilation systems. Follow current versions of ASTM standard methods, EPA compendium methods, or ISO methods.

END OF SECTION 018113

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Deyo Hall Rehabilitation and Upper Floor Addition

3/26/2018

Y	?	N			
1			Credit 1	Integrative Process	1

6	4	22	**Location and Transportation**		Possible Points:	32
		16	Credit 1	LEED for Neighborhood Development Location		16
1			Credit 2	Sensitive Land Protection		1
		2	Credit 3	High Priority Site		2
5			Credit 4	Surrounding Density and Diverse Uses		5
	1	4	Credit 5	Access to Quality Transit		5
	1		Credit 6	Bicycle Facilities		1
	1		Credit 7	Reduced Parking Footprint		1
	1		Credit 8	Green Vehicles		1

Y	?	N				
2	7	1	**Sustainable Sites**		Possible Points:	10
Y			Prereq 1	Construction Activity Pollution Prevention		Required
1			Credit 1	Site Assessment		1
	2	0	Credit 2	Site Development--Protect or Restore Habitat		2
1			Credit 3	Open Space		1
	2	1	Credit 4	Rainwater Management		3
	2		Credit 5	Heat Island Reduction		2
	1		Credit 6	Light Pollution Reduction		1

Y	?	N				
6	3	2	**Water Efficiency**		Possible Points:	11
Y			Prereq 1	Outdoor Water Use Reduction		Required
Y			Prereq 2	Indoor Water Use Reduction		Required
Y			Prereq 3	Building-Level Water Metering		Required
2			Credit 1	Outdoor Water Use Reduction		2
3	3		Credit 2	Indoor Water Use Reduction		6
		2	Credit 3	Cooling Tower Water Use		2
1			Credit 4	Water Metering		1

Y	?	N				
16	4	13	**Energy and Atmosphere**		Possible Points:	33
Y			Prereq 1	Fundamental Commissioning and Verification		Required
Y			Prereq 2	Minimum Energy Performance		Required
Y			Prereq 3	Building-Level Energy Metering		Required
Y			Prereq 4	Fundamental Refrigerant Management		Required
4		2	Credit 1	Enhanced Commissioning		6
9	1	8	Credit 2	Optimize Energy Performance		18
		1	Credit 3	Advanced Energy Metering		1
2			Credit 4	Demand Response		2
	1	2	Credit 5	Renewable Energy Production		3
1			Credit 6	Enhanced Refrigerant Management		1
	2		Credit 7	Green Power and Carbon Offsets		2

Y	?	N			
9	**3**	**0**	**Materials and Resources**	Possible Points:	13
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
4			Credit 1	Building Life-Cycle Impact Reduction	5
1	**1**		Credit 2	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1	**1**		Credit 3	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	**1**		Credit 4	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit 5	Construction and Demolition Waste Management	2

Y	?	N			
6	**8**	**2**	**Indoor Environmental Quality**	Possible Points:	16
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke Control	Required
1	**1**		Credit 1	Enhanced Indoor Air Quality Strategies	2
3			Credit 2	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
	2		Credit 4	Indoor Air Quality Assessment	2
	1		Credit 5	Thermal Comfort	1
1	**1**		Credit 6	Interior Lighting	2
	1	**2**	Credit 7	Daylight	3
	1		Credit 8	Quality Views	1
	1		Credit 9	Acoustic Performance	1

Y	?	N			
2	4		**Innovation**	Possible Points:	6
1	**4**		Credit 1	Innovation	5
1			Credit 2	LEED Accredited Professional	1

Y	?	N			
3	1		**Regional Priority**	Possible Points:	4
1			Credit 1	Regional Priority: Specific Credit	1
1			Credit 2	Regional Priority: Specific Credit	1
1			Credit 3	Regional Priority: Specific Credit	1
	1		Credit 4	Regional Priority: Specific Credit	1

Y	?	N			
51	34	40	**Total**	Possible Points:	126

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

SECTION 018120
CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT

PART 1- GENERAL

1.1 CONSTRUCTION IAQ MANAGEMENT GOALS FOR THE PROJECT

A. The Owner has established that this Project shall minimize the potential detrimental impacts on Indoor Air Quality (IAQ) resulting from poor construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site, poor housekeeping, shall be minimized.

1.2 LEED GENERAL REQUIREMENTS

A. The Owner requires the contractor to implement practices and procedures to meet the project's environmental performance goals. Specific project goals that may impact this area of work include: use of recycled content materials; use of locally manufactured materials; use of low emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the contractors, shall not be allowed if such changes compromise the stated LEED criteria.

1.3 SUMMARY

A. This section includes requirements for the development of a Construction Indoor Air Quality Management Plan (alternatively referred to as the Plan). The Plan shall be developed by the contractor and be approved by the Owner or their designated representative. The Plan shall be implemented throughout the duration of the project construction under the direction of the contractor and shall be documented per the Submittal Requirements of Item 1.6 below. The Plan is included as part of the LEED requirements for the project.
B. This Plan should adhere to the requirements outlined in Chapter 3 of the Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."

1.4 RELATED SECTIONS

A. All sections of the Specifications related to interior construction, MEP systems, and items affecting indoor air quality.
B. All sections including adhesives, sealants, and architectural coatings products.

1.5 REFERENCES AND RESOURCES

A. Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2008, ANSI/SMACNA 008–2008, Chapter 3.

1.6 CONSTRUCTION IAQ MANAGEMENT PLAN – OVERVIEW

A. The contractor shall prepare and submit a Construction IAQ Management Plan to the Owner's Representative for approval. The Construction IAQ Management Plan shall meet the following criteria:

1. Construction activities shall be planned to meet or exceed the minimum requirements included in Chapter 3 of the Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction" 2nd edition, 2008.

2. The Plan should specify the location, type, amount, sequence and timing of the various control measures, including emergency procedures, and labor, materials and time to implement to them.

3. Absorptive materials shall be protected from moisture damage when stored on site and after installation.

4. Provide adequate time for airing out of new materials and for proper curing of concrete prior to covering.

5. Filtration media shall be installed to protect ductwork and/or equipment used during the construction process, per Item 2.1 Filtration Media of this specification.

6. A Sequence of Finish Installation Plan shall be developed, highlighting measures to reduce the absorption of VOCs by materials that act as "sinks."

7. Upon approval of the Plan by the Owner, it shall be implemented by the contractors through the duration of the construction process and documented in accordance with the Green Building Submittal Requirements of this Section.

1.7 LEED SUBMITTAL REQUIREMENTS

A. The contractors shall submit the following required records and documents:

1. A construction schedule outlining the start-up date and expected duration of all Construction IAQ Management Plan control measures.

2. A copy of the Construction IAQ Management Plan and the Sequence Installation Plan, as defined in section 1.6 of this specification.

3. A list of filtration media used, including manufacturer, model number, MERV value, location installed, and date of replacement prior to occupancy.

4. Product cut sheets for all filtration media used during construction and installed immediately prior to occupancy, with MERV values highlighted. Cut sheets shall be submitted with the contractor's "approved" stamp as confirmation that the products submitted are the products installed on the project.

5. At least eighteen (18) photographs – six (6) taken on three (3) different occasions during construction, labeled with the SMACNA approach illustrated – that document the implementation of the Construction IAQ Management Plan

throughout the course of the project construction. Examples include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage (to prevent moisture damage). Photographs shall include integral date stamping and shall be submitted with brief descriptions or be referenced to project meeting minutes or similar project documents.

6. Documentation of duct cleaning and testing.

7. All meeting minutes, checklists, worksheets, notifications, and deficiency or resolution logs related to IAQ.

PART 2 - PRODUCTS

2.1 FILTRATION MEDIA

A. If air handlers are used during construction, filtration media must be used at each return grill and have a Minimum Efficiency Reporting Value (MERV) of at least 8.

B. All filtration media shall be replaced immediately prior to flushout and must have a Minimum Efficiency Reporting Value (MERV) of 13. Filtration media should be reviewed after the flushout is complete and replaced if necessary.

PART 3 - EXECUTION

3.1 CONSTRUCTION IAQ MANAGEMENT PLAN – DETAILED REQUIREMENTS

A. SMACNA Guidelines, as stated in Chapter 3 of the referenced "IAQ Guidelines for Occupied Buildings Under Construction," outline IAQ measures in five categories as listed below. The Construction IAQ Management Plan shall be organized in accordance with the SMACNA format and shall address measures to be implemented by the contractors in each of the five categories (including subsections). All subsections shall be listed in the Plan; items that are not applicable for this project should be listed as such.

1. HVAC Protection: Will include Return Size, Central Filtration, Supply Side and Duct Cleaning

    a. Contractors will protect air handling and distribution equipment, and air supply and return ducting during construction. The contractor's and CM's designated representative will inspect work and monitor all work to ensure compliance.

    b. All ductwork arriving on site will be sealed with plastic sheeting and stored on pallets or dunnage until installed.

    c. Contractors will cover and protect all exposed air inlets and outlets, opening, grilles, ducts, plenums, etc., to prevent water, moisture, dust and other contaminate intrusion.

    d. Contractors will apply protection immediately after ducting.

    e. Ducting runs will be protected at the end of day's work.

f. Contractors will inspect temporary filtration weekly and replace as required to maintain the proper ventilation rates in the building.

2. Source Control
    a. Contractors will protect stored on-site or installed absorptive or porous materials such as batt insulation.

    b. Contractors will not use wet, damaged porous materials in the building.

    c. Contractors will use low emitting paints, sealants, adhesives and carpet.

    d. Product Substitution – Utilize low emitting products as specified in Related Sections 1.4 above.

    e. Modifying Equipment Operation as necessary to meet IAQ objectives. This could include substituting cleaner equipment or changing operating procedures.

    f. Changing Work Practices – Modify work practices to contain odors and emissions.

    g. Local Exhaust – Pollution sources should be directly exhausted to the outside. Depending on the nature of the materials, and location of the exhaust, special filtration may be necessary. Any emission to the outside must be in compliance with applicable regulations and should be directed away from intakes.

    h. Air Cleaning – Where exhaust is not feasible, local recirculation of air through a portable air cleaner may be effective. Filtration media should be appropriate for the material being controlled.

    i. Cover or Seal – Reduce exposed surfaces to reduce emissions.

3. Pathway Interruption
    a. Depressurize Work Area

    b. Pressurize Occupied Space

    c. Erect Barriers to Contain Construction Areas

    d. Relocate Pollutant Sources

    e. Temporarily Seal the Building

4. Housekeeping
    a. Institute cleaning activities designed to control contaminants in building spaces during construction and prior to occupancy.

    b. Porous building materials should be protected from exposure to moisture and stored in a clean area prior to installation.

c. Utilize vacuums with high efficiency particulate filters.

d. Increase cleaning frequency.

e. Utilize wetting agents for dust.

5. Scheduling
   a. Sequence construction activities to minimize impact on the indoor air quality.
   b. Plan adequate time to complete work so flush out and IAQ test procedures can be completed prior to occupancy.

B. Protection of Materials from Moisture Damage: As part of the Housekeeping section of the Construction IAQ Management Plan, measures to prevent installed materials or material stored on site from moisture damage shall be described. This section should also describe measures to be taken if moisture damage does occur to absorptive materials during the course of construction.

C. Replacement of Filtration Media: Under the HVAC Protection section of the Construction IAQ Management Plan, a description of the filtration media in all ventilation equipment shall be provided. The description shall include replacement criteria for filtration media during construction and confirmation of filtration media replacement for all equipment immediately prior to occupancy. Filtration media shall meet the requirements of Item 2.1 (Filtration Media) of this specification.

D. Sequence of Finish Installation of Materials
   1. Absorptive materials should be installed *after* the installation of materials or finishes, which have high short-term emissions of VOCs, formaldehyde, particulates, or other air-borne compounds. Absorptive materials include, but are not limited to, carpets, acoustical ceiling panels, fabric wall coverings, insulations (exposed to the air stream), upholstered furnishings, and other woven, fibrous or porous materials. Materials with high short-term emissions include, but are not limited to, adhesives, sealants, and glazing compounds (specifically those with petrochemical vehicles or carriers), paints, wood preservatives, and finishes, control and/or expansion joint filters, hard finishes requiring adhesive installation, gypsum board (with associated finish processes and products) and composite or engineered wood products with formaldehyde binders.

   2. The contractor shall develop a sequencing schedule that identifies how the sequencing will occur for the project. The schedule shall be submitted to the Owner's Representative in accordance with the Submittal Requirements of this Section.

E. If building HVAC Systems are used to supply the ventilation air, filtration media shall be installed per the requirements of Item 2.1 (Filtration Media) of this specification.

F. IAQ Management Before Occupancy

   1. Per LEED v4 New Construction, Credit EQ 4 *Indoor Air Quality Assessment Option 1 – Flushout* - new filtration media should be installed and a building flush-out performed by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of

gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60% RH.

2. In order to properly implement and document this flushout the contractor should do the following:
    a. With assistance from the design engineer, determine the required duration for the flushout.
    b. Incorporate the flushout duration into the construction schedule. No construction activities can be taking place during the flushout.
    c. Coordinate with the controls (BMS) contractor for the trending, tracking and reporting documentation required including outside airflow quantities, space temperature and humidity tracking, etc.
    d. Coordinate with the testing and balancing contractor (TAB) to verify the air volume being supplied by each air handling unit included in the flushout.

3. Indoor Air Quality Testing may also be performed but is not part of this contract.

G. Implementation and Coordination

1. The contractor shall be responsible for implementation of the Construction IAQ Management Plan, and for the coordination of the Plan with all affected trades. The contractor shall designate one individual as the Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Owner and Owner's Representative on a regular basis, and for assembling the required LEED documentation. The contractor shall include provisions in the Construction IAQ Management Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order, or to rectify non-compliant conditions.

2. Contractors shall be responsible for the implementation of specific control measures, as specified in the Construction IAQ Management Plan. Contractors shall coordinate their responsibilities through their designated Construction IAQ Representative.

*****

SECTION 019113
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings, Individual Specification Sections, and the Commissioning Plan, apply to this Section.

1.2 SUMMARY

A. This project will have selected building equipment and systems commissioned.

B. Section includes general, procedural, and administrative requirements that apply to implementation of commissioning.

C. General Provisions for Commissioning:

1. Selected building systems and equipment to be commissioned are identified in Division 24.
2. The commissioning process shall be directed by the Commissioning Authority, provided by the Owner.
3. The responsible Contractor shall act as the Commissioning Agent, and shall be responsible for executing the commissioning process as directed by the Commissioning Authority, and as defined in Division 24.
4. The commissioning process is defined in Division 24 and includes responsibilities for each Commissioning Team member including the Commissioning Agent.

D. Related Sections:

1. General Conditions, General Requirements, Commissioning Specification Sections listed in Division 24, and Sections referenced in Division 24 apply to this Section.

E. References:

1. Owner's Project Requirements (OPR), Basis of Design (BoD), and Design Intent (DI) documents.
2. Dormitory Authority State of New York: Building Commissioning Guidelines – 2006 http://www.dasny.org/construc/build_comm_guide/index.php
3. ASHRAE Guideline 0-2005: The Commissioning Process
4. ASHRAE Guideline 1.1-2007: HVAC & R Technical Requirements for the Commissioning Process.

1.3 DEFINITIONS

A. Basis of Design (BoD): A document prepared by the Design Professional that records how the designer has met the owner's project requirements. It includes the concepts,

calculations, decisions, and product selections and how applicable regulatory requirements, standards, and guidelines have been met. The document includes descriptions and lists of individual items that support the design process.

B. Commissioning (Cx): A quality assurance process that documents specified systems and components are provided and tested to meet the Owner's needs and the design intent in accordance with the Contract Documents.

C. Commissioning Agent (CA): The Contractor. For the purposes of commissioning the Contractor shall assume the role, tasks, and responsibilities of the Commissioning Agent. Note that per the Owner's Building Commissioning Guidelines, the Owner does not allow the Commissioning Authority and Commissioning Agent to be the same organization or person. The Commissioning Agent shall assign a representative with expertise and authority to act on its behalf to participate in the commissioning process.

D. Commissioning Authority (CxA): The Professional, appointed by the Owner, to direct and coordinate the commissioning process.

E. Commissioning Plan (Cx Plan): A document, prepared by the Commissioning Authority, defining the commissioning process including schedules, responsibilities, documentation requirements, and functional performance test requirements.

F. Commissioning Team: Individuals and entities, as deemed appropriate by the CxA, appointed by the Owner and Contractor, having the authority to act on their behalf, explicitly organized to implement the commissioning process, through coordinated action and defined in the contract documents and the Commissioning Plan.

G. Design Intent (DI): A document prepared by the Design Professional that summarizes design goals of the design phase.

H. Owner's Project Requirements (OPR): A document prepared by the Design Professional that defines the functional requirements and the expectations for operation.

I. Systems and Energy Management Manual: A composite document that expands the scope of the operation and maintenance manual by including additional information gathered by the commissioning process as required by the New York State Green Building Tax Credit, Section 638.8 (k)(2).

1.4 COMMISSIONING TEAM

A. The Commissioning Team shall consist of, but not be limited to, the Owner, Design Professional, Commissioning Authority, Commissioning Agent, suppliers, and specialists, in accordance with the Commissioning Plan.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

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SECTION 024119
SELECTIVE DEMOLITION AND REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Selective demolition and removal of all existing building construction where shown and/or required to execute the work.
   2. Selective demolition and removal of all sitework where shown and/or required to execute the work.
   3. If asbestos, suspect, and/or other environmental materials/items are disturbed &/or encountered, cease operations and notify owner immediately.

B. Work Not Included
   1. Specifically excluded from the work of this section is the removal of asbestos containing material. Asbestos containing material scheduled for removal and disposal will be by an Asbestos Abatement Subcontractor by Division 2. Ensure the asbestos abatement is completed and the areas are broken down before beginning demolition.
   2. Removal of plumbing, heating, and electrical work by Division 22, 23, and 26 respectively.

1.2 QUALITY ASSURANCE

A. Perform all work in strict accordance with all applicable codes, laws and ordinances having jurisdiction over the work.

1.3 SUBMITTALS

A. Schedule of Selective Demolition Activities. Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping and continuation of utility services.
   4. Use of elevator and stairs.
   5. Locations of proposed dust and noise control temporary partitions and means of egress.
   6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

B. Inventory: After selective demolition is complete, submit a list of items that have been salvaged for Owner's use.

C. Predemolition Photographs: Record existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations.

D. Perform and document a pre-construction survey of the existing conditions of all existing windows, including operation, finish, screen condition and internal blind operation with Owners representative.

1.4 LEED REQUIREMENTS:

A. Credit MR 1, Option 3. : Building Life-Cycle Impact Reduction: Reuse or salvage building materials on site as a percentage of the surface areas. Include structural elements (floor and decking) and enclosure materials (exterior skin and framing) and permanently installed interior elements (walls, doors, floor covering, ceiling systems). Excluding window assemblies and hazardous materials that are remediated form the project.

B. Credit MR 5: Construction and Demolition Waste Management: Recycle and/or salvage nonhazardous construction and demolition debris. Develop and implement a construction waste management plan that identifies both demolition construction and debris and materials to be diverted from landfill disposal in conformance with Section 017419 – Construction Waste Management and Disposal.

1.5 JOB CONDITIONS

A. The nearby sewage pump building, site lighting, and site gate that are fed from the basement of Deyo Hall shall remain fully operational throughout the duration of the contract. The contractor shall coordinate the work to maintain its operation.

B. Removal for Salvage: The Owner retains the first right of refusal on all items within the project area. If not claimed by the Owner or designated to be salvaged, all removal items become the property of the Contractor.

C. Traffic: Conduct all operations to ensure minimum interference with adjacent occupied or used facilities, parking, etc.

D. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, trees, other facilities, etc.

E. Damages: Promptly repair damages caused to adjacent facilities by this work at no cost to Owner.

F. Utility Services
   1. Maintain existing utilities indicated to remain, keep in service and protect against damage during demolition operations.
   2. Arrange and pay for disconnection, removing, capping or plugging utility services.

G. Regulatory Requirements: Comply with governing regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

H. Standards: Comply with ANSI A10.6 and NFPA 241.

I. Salvage and deliver to the Owner the following materials:
   1. HTHW coil from existing tank-type hot water heater

2. Generator
3. Gas meter
4. Gas pressure regulator
5. Water meter
6. Domestic Boiler
7. Elevator Machinery and controls
8. HTHW Valves
9. 2 Hot Water pumps
10. Pneumatic controls
11. Hot water circulator
12. Air compressor
13. Heat detectors
14. Fire Panels.
15. 30% Towel Bars and coat hooks
16. 30% Bathroom stall hardware
17. 30% Closet Rods
18. 30% Dispensers
19. 30% Door grilles
20. 100% Door closers
21. 100% Door hardware
22. 50% Panic bars
23. 100% Cylinder cores
24. 100% Card access lock sets, card readers, power supplies and all associated equipment.

PART 2 - PRODUCTS - ***This section not required***

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the work to be demolished and the conditions under which the work will be performed. Do not proceed until all unsatisfactory conditions are corrected.

3.2 METHODOLOGY

A. Selective Demolition
   1. Proceed with demolition in systematic manner.
   2. Locate equipment throughout structure and remove materials so as to not impose excessive loads to supporting walls, floors or framing.

B. Coordination: The Contractor shall coordinate the selective demolition with the removal of plumbing, HVAC and electrical work by Division 22, 23, and 26 respectively. The Contractor shall immediately notify the Architect should mechanical and electrical equipment not scheduled for removal be encountered.

C. Ownership and Disposition of Materials: The Owner retains the first right of refusal on all items within the Project area either presently stored or resulting from the wrecking operation. These items and any others shall remain the Owner's property and will be transported by the Contractor a storage area on site designated by the Owner. All other material not claimed by the Owner or designated to be salvaged, shall be removed and disposed of by the Contractor.

D. Waste Management Plan:
   1. Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract in compliance with Section 017419 – Construction Waste Management and Disposal.
   2. Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
   3. Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

E. Rubbish Removal
   1. Clean up the rubbish (refuse, debris and removed materials and equipment) resulting from the work at least once a day and more often if the rubbish interferes with the work of others or presents a hazard. Leave work areas broom clean at the end of each day.
   2. Temporary storage of rubbish in a dumpster on the site is permitted.
   3. Remove rubbish from property on a regular basis.
   4. The Contractor shall comply with the applicable laws and ordinances governing the disposal of materials, debris, rubbish and trash.

F. Interruption of Services: All uncharted conduits, mains, lines, etc. encountered in the project site shall be taken care of properly and safely by the Contractor, who shall immediately notify the authority or public corporation to whom they belong, in order that they may be changed in such a manner as not to interfere with the Work.

G. Clean-up: Upon completion of this work, the Contractor shall remove all temporary construction no longer needed, equipment, materials, trash and debris of all kinds and shall leave the area in a neat condition ready to receive the new construction.

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SECTION 028200
ASBESTOS REMOVAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This asbestos abatement Project will consist of the removal and disposal of asbestos containing materials (ACM) and presumed asbestos containing materials (PACM) at the Deyo Hall Rehabilitation & Addition Project at SUNY New Paltz, 1 Hawk Drive New Paltz, New York, 12561 - DASNY Project No. 341830.

B. The work shall include but not be limited to the removal of the following ACMs:

Floor/Level	Description of ACM	Approximate Quantity (SF/LF/Unit)
Basement, 1st, 2nd, 3rd	Acoustical Ceiling Texture	29,000 SF
Basement, 1st, 2nd, 3rd	Vinyl Asbestos Floor Tile and Mastic	27,300 SF
Basement, 1st, 2nd, 3rd	Residual Floor tile Mastic Below Carpet and Vinyl Composite Tile	10,000 SF
Buried Transite Duct	Buried Transite Duct (up to 18" O.D.)	215 LF
Basement, 1st, 2nd, 3rd	Incandescent Light Fixture Wire Insulation	110 Fixtures, 1,100 LF/36 SF
Basement, 1st, 2nd, 3rd	Mud Pipe Fitting Insulation	1,000 Fittings /1,000 LF
Basement	Pin Mastic and Contaminated Fiberglass Duct Wrap	200 SF
Basement	Hot Water Tank Insulation	300 SF
1st, 2nd	Window Glazing Compound (This material also contains PCBs)	500 LF/11 SF
Basement, 1st, 2nd, 3rd	Wooden Fire Door Core Insulation	13 Doors/273 SF
Basement	Exterior Foundation Vapor Barrier	300 SF
Basement	Pipe Flange Gaskets	18 Gaskets/9 SF

See HM Drawings for additional detail and location information.

C. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.

D. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.

E. Working hours shall be as required and approved by the Owner. Asbestos abatement activities including, but not limited to, work area preparation, gross removal activities, cleaning activities, waste removal, etc. may need to be performed during 'off-hours' (including nights and weekends). In addition, multiple mobilizations may be required

to perform the work identified in this project. The Contractor shall coordinate and schedule all Work with the facility and Owner's representative.

1.02 SPECIAL JOB CONDITIONS

A. Any special job conditions, including variances obtained by the Owner, are described below.

1.03 PERMITS AND COMPLIANCE

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.

B. Perform asbestos related Work in accordance with New York State Industrial Code Rule 56 (herein referred to as Code Rule 56), 40 CFR 61, and 29 CFR 1926. Where more stringent requirements are specified, adhere to the more stringent requirements.

C. The Contractor must maintain current licenses, permits and certifications pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.

D. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Code Rule 56.

E. The Contractor shall comply fully with any Variance secured from regulatory agencies by the Owner in the performance of the Work. Any Variance applications previously submitted are included as an appendix of this specification.

F. The Contractor shall be responsible for obtaining all other Variances as may be required for the Project or as requested by the Owner. Approval of the Owner is required prior to submission of a Variance application to any regulatory agency. Failure to obtain Owner approval may result in Owner not permitting variance to be used on the project.

G. The Contractor shall be responsible for compliance with The New York State Uniform Fire Prevention and Building Code, or its successor during all Work at the site.

H. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.04 SUBMITTALS

A. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below, with 1 copy going directly to the DASNY Code Compliance Unit for review and approval prior to the commencement of asbestos abatement activities:
   1. Contractor license issued by New York State Department of Labor.
   2. A list of Projects performed within the past two (2) years including the dollar value of all Projects. Provide Project references to include Owner, consultant, and air monitoring firm's name, contact persons, address, and phone number.
   3. Progress Schedule:

a. Show the complete sequence of abatement activities and the sequencing of Work within each building or building section.
b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.

4. Project Notifications: As required by Federal and State regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
5. Building Occupant Notification: As required by regulatory agencies.
6. Abatement Work Plan: Provide plans that clearly indicate the following:
   a. All Work Areas/containments numbered sequentially.
   b. Locations and types of all decontamination enclosures.
   c. Entrances and exits to the Work Areas/containments.
   d. Type of abatement activity/technique for each Work Area/containment.
   e. Number and location of negative air units and exhaust. Also provide calculations for determining number of negative air pressure units.
   f. Location of water and electrical connections to building services.
   g. Waste transport routes through the building to the waste storage container.
7. Disposal Site/Landfill Permit from applicable regulatory agency.
8. NYS Department of Environmental Conservation Waste Transporter Permit.

B. On-Site Submittals: Refer to Part 3.01.C & D for all submittals, documentation, and postings required to be maintained on-site during abatement activities.

C. Project Close-out Submittals: Within 30 days of the completion of each abatement phase, the Contractor shall submit one hard copy of the documents listed below to DASNY Code Compliance and one copy to the environmental consultant for review and approval prior to Contractor's final payment. Once DASNY Code Compliance approves the close-out submittal, the Contractor shall provide three sets of the approved close-out documents (double-sided and bound) to DASNY Project Management, including one set to be distributed to the facility.

1. All waste disposal shipment records and disposal logs. (Original waste shipment records shall be sent to DASNY Code Compliance).
2. OSHA compliance air monitoring records conducted during the Work.
3. Daily progress log, including the entry/exit log.
4. Provide the Contractor's Acknowledgement Statement (Appendix C) that lists all Workers used in the performance of the Project, including name and NYS DOL certification number. The Statement shall be notarized (Original notarized statement shall be sent to DASNY Code Compliance).
5. Disposal Site/Landfill Permit from applicable regulatory agency.
6. Project notifications, amended notifications, Variances.

1.05 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.

B. Agenda for this conference shall include but not necessarily be limited to:

1. Contractor's scope of Work, Work plan, and schedule to include number of workers and shifts.
2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
3. Environmental Consultant's duties, functions, and authority.
4. Contractor's Work procedures including:
   a. Methods of job site preparation and removal methods.

b. Respiratory protection.
c. Disposal procedures.
d. Cleanup procedures.
e. Fire exits and emergency procedures.

5. Contractor's required pre-work and on-site submittals, documentation, and postings.
6. Contractor's plan for twenty-four (24) hour Project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
7. Temporary utilities.
8. Handling of furniture and other moveable objects.
9. Storage of removed asbestos containing materials.
10. Waste disposal requirements and procedures, including use of the Owner supplied waste shipment record.

C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.06 APPLICABLE STANDARDS AND REGULATIONS

A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:

B. Federal Regulations:
1. 29 CFR 1910.1001, "Asbestos" (OSHA)
2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
5. 29 CFR 1926, "Construction Industry" (OSHA)
6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
7. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
8. 40 CFR 61, Subpart A, "General Provisions" (EPA)
9. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
10. 49 CFR 171-172, Transportation Standards (DOT)

C. New York State Regulations:
1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL)
2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
4. "New York State Uniform Fire Prevention and Building Code"

D. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
4. EPA 530-SW-85-007, Asbestos Waste Management Guidance
5. ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects"

1.07 NOTICES

A. The Contractor shall provide notification of intent to commence asbestos abatement activities as indicated below.

1. At least ten (10) Working days prior to beginning abatement activities, send written notification to:

U.S. Environmental Protection Agency
National Emissions Standards for Hazardous Air Pollutants (NESHAPS) Coordinator
26 Federal Plaza
New York, NY 10007

2. At least ten (10) days prior to beginning abatement activities send written notification to:

New York State Department of Labor
Division of Safety and Health, Asbestos Control Program.
State Office Campus
Building 12 - Room 161B
Albany, NY 12240

B. The Contractor is required to send notifications to regulatory agencies via electronic, mail, or package delivery service that will provide proof of delivery and receipt.

C. The Contractor shall be responsible for maintaining current project filings with regulatory agencies for the duration of the project.

D. The Contractor shall post and/or provide Building Occupant Notification at least 10 days prior to beginning abatement activities as required by Code Rule 56.

1.08 PROJECT MONITORING AND AIR SAMPLING

A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement Project period. The consultant and all subconsultants shall not have any contractual relationship with the Contractor for the duration of the asbestos project.

B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the air sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.

C. The Consultant shall provide the following administrative services:
1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.

D. The Consultant shall staff the Project with a trained and certified person(s) to act on the Owner's behalf at the job site. This individual shall be designated as the Abatement Project Monitor (APM).
1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site (except for inspection of barriers and negative air system during non-working days).
2. The APM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The APM shall have the authority to Stop Work when gross Work practice deficiencies or unsafe practices are observed, or when ambient fiber concentrations outside the removal area exceed .01 f/cc or background level.
a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.

b. Standby time and air sample collection and analysis required to resolve the situation shall be at the Contractor's expense.

3. The APM shall provide the following services:
   a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
   b. Provide abatement Project air sampling as required by applicable regulations (NYS, AHERA) and the Owner. Sampling will include, but not be limited to background, work area preparation, asbestos handling, final cleaning, and clearance air sampling.
   c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
   d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
   e. Monitor, verify, and document all waste load-out operations including placement of generator and location labels on each waste container, as required by federal regulations.
   f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
   g. The APM shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities, and occurrences.
   h. Verify landfill to be used for waste disposal with waste transporter(driver) and Contractor prior to waste trailer/dumpster leaving site. Confirm the waste transporter firm and landfill are listed on the regulatory notifications for the project and the waste transport vehicle license number is listed on the current NYS DEC Waste Transporter permit.
4. The following minimum inspections shall be conducted by the APM, accompanied by the Contractor's supervisor. Additional inspections shall be conducted as required by Project conditions and/or the Owner's direction. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the APM.
   a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
   b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
   c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the APM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.
   d. Pre-Encapsulation Inspection: The purpose of this inspection is to ensure the complete removal of Asbestos Containing Material (ACM), from all surfaces in the Work Area prior to encapsulation.
   e. Visual Clearance Inspection: The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.
   f. Post-Clearance Inspection: The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the Work Area after satisfactory final clearance sampling and removal of all isolation and critical barriers and equipment from the Work Area.

g. Punch List Inspection: The purpose of this inspection is to verify the Contractor's certification that all Work has been completed as contracted and the existing condition of the area prior to its release to the Owner.

E. The Consultant shall provide abatement Project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include but is not limited to, background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.

1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM). Results shall be available within 24 hours of completion of sampling.
2. Samples shall be collected as required by applicable regulations (New York State and/or AHERA) and these specifications. If Transmission Electron Microscopy (TEM) clearance air sampling is utilized by the owner, the clearance criteria and sampling protocols must be in compliance with AHERA. If PCM air sample analysis results exceed the satisfactory clearance criteria, then TEM analysis of the entire set of clearance air samples may be used, provided that a standard NIOSH/ELAP accepted laboratory analysis method is utilized that shall report each air sample result in fibers per cubic centimeter.
3. If the air sampling during any phase of the abatement project reveals airborne fiber levels at or above .01 fibers/cc or the established background level, whichever is greater, outside the regulated Work Area, Work shall stop immediately and corrective measures required by Code Rule 56 shall be initiated. Notify DASNY project personnel as well as all employers and occupants in adjacent areas. The Contractor shall bear the burden of any and all costs incurred by this delay.
4. The Environmental Consultant shall submit copies of all elevated air sampling results collected during abatement and all elevated final air clearance results to the Commissioner of Labor, as required by regulation.

1.09 CONTRACTOR AIR SAMPLING

A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being worn and utilized.

B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.

C. The Contractor's laboratory analysis of air samples shall be conducted by an NYS DOH ELAP approved laboratory. The consultant shall not collect or analyze the Contractor's air samples.

D. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within five (5) days. Failure to comply with these requirements may result in all work being stopped until compliance is achieved.

1.10 PROJECT SUPERVISOR

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:

1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.
2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
3. The Project Supervisor must be able to speak, read, and write English fluently, as well as communicate in the primary language of the Workers.

B. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Contractor may not remove the Project Supervisor from the Project without the written consent of the Owner and the Environmental Consultant; however the Project Supervisor shall be removed from the Project if so requested by the Owner.

C. The Project Supervisor shall maintain the bound Daily Project Log and the entry/exit logs as required by New York State Department of Labor and section 2.03 of the specifications and the Waste Disposal Log (Appendix B) required by section 4.03 of the specifications.

D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.11 MEDICAL REQUIREMENTS

A. Before exposure to airborne asbestos fibers, provide Workers with a comprehensive medical examination as required by 29 CFR 1910.1001, and 29 CFR 1926.1101.
1. This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1910.1001, and 29 CFR 1926.1101 within the past year.
2. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving potential disturbance of asbestos fibers.

1.12 TRAINING

A. As required by applicable regulations, prior to assignment to asbestos Work instruct each employee with regard to the hazards of asbestos, safety and health precautions, and the use and requirements of protective clothing and equipment.

B. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.1101. Provide respirator training and fit testing.

1.13 RESPIRATORY PROTECTION

A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH).

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual.

C. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators (PAPR) are the minimum allowable respiratory protection permitted to be utilized during gross removal operations of OSHA Class I or OSHA Class II friable ACM.

D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.

G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day.

H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day. Any loose respirator filters found within the regulated area, must be disposed of as asbestos waste.

I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.

J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

1.14 DELIVERY AND STORAGE

A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.

B. Store all materials at the job site in a suitable and designated area.
   1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
   2. Protect materials from unintended contamination and theft.
   3. Storage areas shall be kept clean and organized.

C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified. This includes unused Contractor supplies located in the regulated work area.

D. All waste streams (asbestos/PCBs/hazardous/universal/C&D debris, etc.) generated during this project shall be properly segregated and stored in separate distinct areas. Wastes shall not be comingled.

1.15 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the asbestos Work Areas, including lighting circuits. Any electrical power passing through the Work Areas that can't be shut down due to health and safety reasons, shall be protected as per the requirements of Industrial Code Rule 56 and shall not be utilized within the work area.

B. Provide temporary 120-240 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
   1. Where available, obtain from Owner's existing system. Otherwise provide power from other sources (i.e. generator).
   2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.

3. Provide wiring and receptacles as required by the Environmental Consultant for project monitoring and air sampling equipment (pumps, fans, leaf blowers, etc.).
4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.

C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
1. The entire Work Area shall be kept illuminated at all times.
2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.

D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.

E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 PRODUCTS

2.01 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.

B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.

D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

2.02 SIGNS AND LABELS

A. Provide warning signs and barrier tapes at all approaches to asbestos Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.
1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend.

DANGER ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA

2. Provide 3" wide yellow barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos Work Area. Install tape 3' to 4' AFF.

B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.

1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172: (Note: Include "RQ" for friable asbestos waste only.)

RQ, NA2212, (WASTE) ASBESTOS, 9, PGIII

3. Generator identification information shall be affixed to each waste container or any packaging used to containerize asbestos waste indicating the following printed in indelible ink:

Generator Name
Facility Name
Facility Address
Date

2.03 DAILY PROJECT LOG & WORK AREA ENTRY/EXIT LOG

A. Provide a bound Daily Project Log. The log shall contain on title page the Project name; name, address and phone number of Owner; name, address and phone number of Environmental Consultant; name, address and phone number of Abatement Contractor; emergency numbers including, but not limited to local Fire/Rescue department and all other New York State Department of Labor requirements.

B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.

C. All persons entering and exiting the Work Area shall sign the entry/exit log and include name, certification number, and time.

D. The Project Supervisor shall document all Work performed daily and note all inspections required by Code Rule 56, i.e. testing and inspection of barriers and enclosures.

2.04 SCAFFOLDING AND LADDERS

A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.

B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.05 SURFACTANT (AMENDED WATER)

A. Wet all asbestos-containing materials prior to removal with surfactant mixed and applied in accordance with manufacturer's printed instructions.

2.06 ENCAPSULANT

A. Encapsulant shall be tinted or pigmented so that application when dry is readily discernible.

B. The encapsulant solvent or vehicle shall not contain a volatile hydrocarbon.

2.07 WASTE DISPOSAL BAGS, DRUMS, AND CONTAINERS

A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall also be imprinted with U.S. Department of Transportation required markings.

B. Provide 30 or 55 gallon capacity fiber, plastic, or metal drums capable of being sealed air and water tight if asbestos waste has the potential to damage or puncture disposal bags. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.

C. Containers and bags must be labeled accordance with 40 CFR Part 61 NESHAPS and Code Rule 56. When the bags/containers are moved to the holding area, lockable trailer, or lockable hardtop dumpster from the waste decontamination system washroom, each bag/container must also be appropriately labeled with the date moved in waterproof markings.

D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

2.08 HEPA VACUUM EQUIPMENT

A. All vacuuming performed under this contract shall be performed with High Efficiency Particulate Air (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

2.09 POWER TOOLS

A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be manufacturer equipped with HEPA filtered local exhaust ventilation.

2.10 FIRE RETARDANT PLASTIC SHEETING

A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire retardant sheeting.

B. Decontamination enclosure systems shall utilize at least 6 mil opaque fire retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire retardant plastic sheeting shall be used for the flooring.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Should visible emissions or water leaks be observed outside the Work Area, immediately stop Work and institute emergency procedures per Code Rule 56. Should there be elevated fiber levels outside the Work Area, immediately stop Work, institute emergency procedures per Code Rule 56, and notify all employers and occupants in adjacent areas. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

B. Valid NYS DOL Asbestos Handler certification cards shall be on site prior to admittance of any Contractor's employees to the asbestos Work Area.

C. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities at a location approved by the Abatement Project Monitor:
   1. Valid Contractor handling license issued by New York State Department of Labor.
   2. NYS DOL Asbestos Handler certification cards for each person employed in the removal, handling, or disturbance of asbestos.
   3. Daily OSHA personal air monitoring results.
   4. NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.
   5. NYS Department of Environmental Conservation Waste Transporter Permit.
   6. Project documents (specifications and drawings.)
   7. Notifications, Variances, Approved Work Plan. Ensure that the most up-to-date notifications and Variances are on-site.
   8. Applicable regulations.
   9. Safety Data Sheets of supplies/chemicals used on the Project.
   10. Disposal Site/Landfill Permit from applicable regulatory agency.
   11. List of emergency telephone numbers.
   12. Magnahelic manometer semi-annual calibration certification.
   13. Waste Disposal Log.
   14. Daily Project Log.
   15. Entry/Exit Logs.

D. The following documentation shall be maintained on-site by the Abatement Project Monitor during abatement activities:
   1. Valid Contractor handling license issued by New York State Department of Labor.
   2. Air Sample Log.
   3. Air sample results.
   4. Project Monitor Daily Log
   5. Asbestos Survey Report.
   6. A copy of ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects."
   7. Calibration chart for rotometer(s) used on-site.

E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

F. All demolition necessary to access asbestos containing materials for removal must be conducted within negative pressure enclosures by licensed asbestos handlers. Demolition debris may be disposed of as construction and demolition debris provided the Abatement Project Monitor determines that it is not contaminated with asbestos and there has been no disturbance of ACM within the enclosure. If the demolition debris is determined to be contaminated or ACM has been disturbed, it must be disposed of as asbestos waste.

3.02 PERSONNEL DECONTAMINATION ENCLOSURE

A. Provide personnel decontamination enclosure contiguous to the Work Area or as per Variance. The decontamination enclosure shall be attached to the Work Area and not located within it unless isolation barriers are installed. If the decontamination

chamber is accessible to the public it shall be fully framed, sheathed, and lockable to prevent unauthorized entry.

B. Access to the Work Area will be from the clean room through an air-lock to the shower and through an air lock to the equipment room. Each airlock shall be a minimum of three feet from door to door. Additional air locks shall be provided as required by Code Rule 56 for remote decontamination enclosures.

C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil fire retardant plastic sheeting. Two layers of reinforced fire retardant plastic sheeting shall be used to cover the floor.

D. The entrance to the clean room shall have a lockable door with adequate small openings for Work Area make-up air. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.

E. Provide a temporary shower with individual hot and cold water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six Workers. The shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.

F. Shower water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.

G. The equipment room shall be used for the storage of tools and equipment. A walk-off pan filled with water shall be located in the Work Area outside the equipment room for Workers to clean foot coverings when leaving the Work Area. A labeled 6 mil plastic ACM waste bag for collection of contaminated clothing shall be located in this room.

H. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Asbestos Project Monitor.

3.03 WASTE DECONTAMINATION ENCLOSURE

A. Provide a waste decontamination enclosure contiguous to the Work area. The decontamination enclosure shall be attached to the Work Area and not located within it unless isolation barriers are installed. If the decontamination chamber is accessible to the public it shall be fully framed, sheathed, and lockable to prevent unauthorized entry.

B. The waste decontamination enclosure system shall consist of a holding area, air lock and washroom. The airlock shall be a minimum of three feet from door to door. The entrance to the holding area shall have a lockable door.

C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil fire retardant plastic sheeting on walls and ceiling. Two layers of reinforced fire retardant plastic sheeting shall be used to cover the floor.

D. Where there is only one egress from the Work Area, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.

E. The waste wash room water shall be drained, collected, and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.

F. In small asbestos Projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

3.04 WORK AREA ENTRY AND EXIT PROCEDURES

A. Access to and from the asbestos Work Area is permitted only through the personnel decontamination enclosure unless otherwise stipulated in a Site Specific Variance.

B. Workers shall sign the entry/exit log upon every entry and exit.

C. The following procedures shall be followed when entering the Work Area:
   1. Before entering the Work Area, Workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment, and respirators.
   2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.

D. The following procedures shall be followed when exiting the Work Area:
   1. Before leaving the Work Area, gross asbestos contamination will be removed by brushing, wet cleaning and/or HEPA vacuuming, followed by use of the walk-off pan.
   2. In the equipment room, Workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior to entering the shower room. Reusable equipment shall be removed and stored in the equipment room (e,g, work boots).
   3. Workers shall shower thoroughly while wearing respirators, then wash respirator with soap and water prior to removal.
   4. Upon exiting the shower, Workers shall enter the clean room and don new disposable clothing if the Work shift is to continue or street clothes to exit area. Under no circumstances shall Workers enter public non-Work Areas in disposable protective clothing.

E. If remote decontamination enclosures are permitted by Code Rule 56 or a Site Specific Variance, workers shall wear two disposable suits for all phases of Work. Workers exiting the work area shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another work area via the designated pathway required by Code Rule 56.

3.05 WORK AREA PREPARATION

A. Asbestos danger signs shall be posted at all approaches to the asbestos Work Area. Post all emergency exits as emergency exits only on the Work Area side, post with

asbestos caution signs on the non-Work Area side. Provide all non-Work Area stairs and corridors accessible to the asbestos Work Area with warning tapes at the base of stairs and beginning of corridors. Warning tapes shall be in addition to caution signs.

B. Shut down and lock out the building heating, ventilating, and air conditioning systems. Electrical systems and circuits shall also be shut down unless permitted to remain active per Code Rule 56 and appropriately protected and labeled. Existing lighting sources shall not be utilized. Provide temporary electric power and lighting as specified herein.

C. All non-ACM surfaces and objects within the Work Area shall be pre-cleaned using HEPA vacuuming and/or wet-wiping methods. Dry sweeping and any other methods that raise dust shall be prohibited. ACM shall not be disturbed during pre-cleaning.

D. Movable objects within the Work Area shall be HEPA vacuumed and/or wet-wiped and removed from the Work Area.

E. All non-movable equipment in the Work Area shall be completely covered with 2 layers of fire retardant plastic sheeting, at least 6 mil in thickness, and secured in place with duct tape and/or spray adhesive. Active Fire Protection System components in the Work Area shall not be covered with fire retardant plastic sheeting or any other obstruction.

F. Provide enclosure of the asbestos Work Area necessary to isolate it from unsealed areas of the building in accordance with the approved asbestos Work plan and as specified herein.

G. Provide critical barriers by sealing off all openings including but not limited to operable windows and skylights, doorways, diffusers, grills, electrical outlets and boxes, doors, floor drains, and any other penetrations to surfaces in the Work Area enclosure, using 2 layers of at least 6 mil fire retardant plastic sheeting.

H. Provide isolation barriers by installing temporary framing and sheathing at openings larger than 32 square feet forming the limits of the asbestos Work Area. Sheathing thickness must be a minimum of 3/8 inch and all sheathing shall be caulked and the Work Area side sealed with two layers of 6 mil fire retardant plastic sheeting. Isolation barriers in stairwells and at work area egress locations shall not be covered with sheathing, only two layers of 6 mil fire retardant plastic sheeting.

I. Isolation barriers shall be installed at all elevator openings in the Work Area. .Elevators running through the regulated abatement work area shall be shut down or isolated as per Code Rule 56. Elevator controls shall be modified so that elevators bypass the Work Area

J. Provide two independent layers of 6 mil fire retardant plastic sheeting over all floor, wall, and ceiling surfaces. Isolation barriers shall also be covered with two independent layers (for a total of four layers). Sheeting shall be secured with duct tape. All joints in fire retardant plastic sheeting shall overlap 12" minimum. Carpeting left in place shall be covered with 3/8 inch plywood sheathing prior to plasticizing.

K. Unless otherwise specified for removal, the Contractor shall either protect all fiberglass insulation on piping, ductwork, tanks, etc. in the Work Area using two layers of six mil fire retardant plastic sheeting or remove the insulation as asbestos containing waste. If the Contractor elects to remove the fiberglass insulation as asbestos-contaminated,

he/she shall be responsible for reinsulation if reinsulation of removed insulations is part of the Contract or Project.

L. Frame out emergency exits from Work Area. Provide double layer 6 mil fire retardant plastic sheeting and tape seal opening. Post as emergency exits only and tape utility knife to the Work Area side of each exit. Within the Work Area, mark the locations and directions of emergency exits throughout the Work Area using exit signs and/or duct tape.

M. Remove all items attached to or in contact with ACM only after the Work Area enclosure is in place. HEPA vacuum and wet wipe with amended water all items prior to their removal from the Work Area and before the start of asbestos removal operations.

N. Suspended ceiling tiles shall only be removed after Work Area preparation is complete. If possible, non-contaminated ceiling tiles shall be HEPA vacuumed and removed from the Work Area before asbestos removals begin. Contaminated ceiling tiles shall be disposed of as asbestos waste.

3.06 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

A. Provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement and 6 air changes for non-friable flooring and/or mastic removal.

B. Such filtration systems must be made operational after critical and isolation barriers are installed but before wall, floor, and ceilings are plasticized and shall be operated 24 hours per day during the entire Project until the final cleanup is completed and satisfactory results of the final air samples are received from the laboratory.

C. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours (25 continuous days) of operation. HEPA filter sides shall be marked with installation date during all new HEPA filter installations on project.

D. A minimum of one additional filtration unit of at least the same capacity as the primary unit(s) shall be installed and fully functional to be used during primary unit (s) filter changing and in case of primary failure.

E. At no time will the unit exhaust indoors, within 15 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building. Exhaust ducting shall not exceed 25' in length, except as allowed by Industrial Code Rule 56. Provide construction fencing at ground level exhaust termination locations per Code Rule 56.

F. Upon electric power failure or shut-down of any filtration unit, all abatement activities shall stop immediately and only resume after power is restored and all filtration units are fully operating. For shut-downs longer than one hour, all openings into the Work Area, including the decontamination enclosures, shall be sealed.

G. For all OSHA Class I removal Work Areas, the Contractor shall provide a manometer to verify negative air pressure. Manometers shall be read twice daily and recorded within the Daily Project Log.

H. There shall be at least a 4 hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers.

I. Once installed and operational, the Contractor's Supervisor shall conduct daily inspections of the Work Area to insure the airtight integrity of the enclosure and operation of the negative air system. Findings shall be recorded within the Daily Project Log. Inspections shall also be conducted on days when no abatement activities are in progress per Code Rule 56 (i.e. weekends).

3.07 REMOVAL OF ASBESTOS CONTAINING MATERIALS

A. Asbestos-containing materials shall be removed in accordance with the Contract Documents and the approved Asbestos Work Plan. Only one type of ACM shall be abated at a time within a Work Area. Where there are multiple types of ACM requiring abatement, Code Rule 56 procedures for sequential abatement shall be followed.

B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.

C. One Worker shall continuously apply amended water while ACM is being removed.

D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with manufacturer HEPA equipped filtered local exhaust ventilation, as required by regulation.

E. Upon removal of ACM from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc.

F. All removed material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate. Cleanup of accumulations of loose debris or waste shall be performed whenever there is enough accumulation to fill a single bag or container and minimally at the end of each workshift.

G. Large components shall be wrapped in two layers of 6 mil fire retardant plastic sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.

H. Power or pressure washers are not permitted for asbestos removal or clean-up procedures unless approved in a Site Specific Variance and allowed by owner.

I. All open ends of pipe and duct insulation not scheduled for removal shall be encapsulated using lag cloth.

J. All construction and demolition debris determined by the Environmental Consultant to be contaminated with asbestos shall be handled and disposed of as asbestos waste.

K. The use of metal shovels, metal dust pans, etc. are not permitted inside the work area.

3.08 EQUIPMENT AND WASTE CONTAINER DECONTAMINATION AND REMOVAL PROCEDURES

A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. The persons in the Work Area shall not enter the airlock. No gross removal operations are permitted when waste transfer is in progress.

B. The containers and equipment shall be removed from the airlock by persons stationed in the washroom during waste removal operations. The external surfaces of containers and equipment shall be cleaned a second time by wet cleaning.

C. The cleaned containers of asbestos material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated 6 mil plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.

D. The clean recontainerized items shall be moved into the airlock that leads to the holding area. Workers in the washroom shall not enter this airlock.

E. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from the holding area.

F. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area until transfer to the waste container. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

G. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.

H. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.09 WORK AREA DECONTAMINATION, CLEANING, AND CLEARANCE PROCEDURES

A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed unless modified by a Site Specific Variance.

B. First Cleaning:
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
   2. All surfaces in the Work Area shall be wet cleaned, except active fire protection system components that may be damaged by water. A wet-purpose shop vacuum may be used to pick up excess liquid, and may either be decontaminated prior to removal from the Work Area or disposed of as asbestos waste.
   3. The Abatement Project Monitor (APM) shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
   4. The Contractor shall then apply a thin coat of encapsulant to all surfaces in the Work Area that were not the subject of removal. In no event shall encapsulant

be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The APM shall determine adequacy of coverage.

5. After the encapsulant has been applied and the required waiting/settling/ drying time has elapsed, the first layer of fire retardant plastic sheeting shall then be removed and bagged as asbestos waste.

C. Second Cleaning
   1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned. Wet cleaning of active fire protection system components is not necessary if damage may occur.
   2. The APM shall conduct a second visual inspection of the Work Area for cleanliness.
   3. After the required waiting/settling/drying time has elapsed, the second layer of fire retardant plastic sheeting shall be removed and bagged as asbestos waste.

D. Third Cleaning
   1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned. Wet cleaning of active fire protection system components is not necessary if damage may occur.
   2. After the required waiting/settling/drying time has elapsed, the APM shall conduct a third visual inspection of the Work Area for completeness of abatement and cleanliness. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
   3. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant provided no visible asbestos debris/residue; pools of liquid, or condensation remains. NOTE: TEM samples should be used vs. PCM if demolition or other dust-generating evolutions are taking place in adjacent areas, as evident from excessive loading.
   4. Upon receipt of satisfactory final clearance air sampling results, the negative air pressure equipment can then be shut down, and the isolation and critical barriers removed and bagged as asbestos waste. Following this and satisfactory inspections by the project supervisor and the APM for cleanliness, the decontamination enclosures shall be removed.

E. As a result of any visual inspection by the APM or should air sampling results indicate high fiber levels, the Contractor will reclean the affected areas at no additional expense to the Owner.

3.10 TENT ENCLOSURES

A. Tent enclosures may only be used where specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor.

B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Remote personnel decontamination enclosures shall be constructed. Configuration shall be as required by Project size and a washroom with attached airlock shall be constructed contiguous to the tent enclosure for small and large size tent enclosure work areas. For tent enclosures with gross abatement of friable materials, a contiguous decontamination system shall be constructed, maintained and utilized,

except for minor size tent enclosure work areas where an adjacent decontamination room or area is permitted by Code Rule 56.

D. The Work Area shall be precleaned. All objects and equipment that will remain in the restricted area during abatement shall be sealed with two layers of six mil polyethylene and tape.

E. The tent shall be a single use barrier constructed with a rigid frame and at least two layers of six mil polyethylene unless one layer of six mil polyethylene is otherwise permitted by Code Rule 56. Tents with twenty (20) square feet or less of floor space or no gross removal of friable ACM shall be constructed of one (1) layer of six mil polyethylene and shall include walls, ceilings and a floor (except portions of walls, floors and ceilings that are the removal surface) with double folded seams. All seams shall be sealed airtight using duct tape and/or spray adhesive.

F. The tent shall be constructed with at least one airlock for worker/waste egress.

G. A manometer shall be used for all OSHA Class I abatement.

H. Negative air shall be maintained at four (4) air changes per hour for non-friable and glovebag abatement tent enclosure work areas. Eight (8) air changes shall be maintained for friable gross removal tent enclosure work areas. In a Minor size abatement tent enclosure work area a HEPA vacuum may be used to maintain the required air changes.

I. OSHA compliance air monitoring is required per section 1.09.

J. ACM removal shall follow procedures defined in section 3.07.

K. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed in the washroom and shall then be placed in a second bag/container before being transferred to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts. These carts shall be held in the holding area until transfer to the waste container. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
   2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
   3. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces covered with plastic in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The APM shall determine adequacy of coverage.
   4. After the waiting/settling/drying time requirements have elapsed, the Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness

and completion of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.

5. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
6. Upon receipt of satisfactory final clearance air sampling results, the tent shall be collapsed into itself, placed in suitable disposal bags, and transferred through the washroom to the waste storage container. Isolation and critical barriers shall then be removed and bagged as asbestos waste followed by satisfactory visual inspections by the project supervisor and the APM for cleanliness.

3.11 GLOVEBAG REMOVAL

A. Glovebag removals may only be used as specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor. Glovebags may only be used on pipe or duct insulation.

B. In addition to conformance with applicable regulations and variances, glovebag removals are only permitted to be conducted within tent enclosures complying with these specifications.

C. The Contractor shall restrict access to the immediate area where tent/glovebag removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

D. Remote personnel decontamination enclosures shall be constructed. Configuration shall be as required by Project size and a washroom with attached airlock shall be constructed contiguous to the tent enclosure.

E. Glovebag removals shall utilize commercially available glovebags of at least six mil thickness. Use shall be in accordance with the manufacturer's instructions and the following minimum requirements:

1. The sides of the glovebag shall be cut to fit the size pipe being removed. Tools shall be inserted into the attached tool pocket.
2. The glovebag shall be placed around the pipe and the open edges shall be folded and sealed with staples and duct tape. The glovebag shall also be sealed at the pipe to form a tight seal.
3. Openings shall be made in the glovebag for the wetting tube and HEPA vacuum hose. The opening shall be sealed to form a tight seal.
4. All glovebags shall be smoke tested by the Asbestos Project Monitor under negative pressure using the HEPA vacuum before removal operations commence. Glovebags that do not pass the smoke test shall be resealed and then retested.
5. After first wetting the materials to be removed, removal may commence. ACM shall be continuously wetted. After removal of the ACM, the piping shall be scrubbed or brushed so that no visible ACM remains. Open ends of pipe insulation shall be encapsulated.
6. After the piping is cleaned, the inside of the glovebag shall be washed down and the wetting tube removed. Using the HEPA vacuum, the glovebag shall be collapsed and then twisted and sealed with tape with the ACM at the bottom of the bag.
7. A disposal bag shall be placed around the glovebag that is then detached from the pipe. The disposal bag is then sealed and transferred through the washroom to the waste storage container.

F. After glovebag removals are complete, tent decontamination procedures shall be followed.

3.12 REMOVALS OF EXTERIOR NON-FRIABLE ACM

A. Except as modified by this section, removal of exterior non-friable ACM (i.e. roof flashings, built-up roofing, siding, caulking, glazing compound, transite, tars, sealers, coatings, and other NOB ACM) shall conform to all provisions of this specification.

B. Unless Site Specific Variances have been otherwise obtained, removals shall be conducted in accordance with the provisions of Code Rule 56.

C. The Work Area shall be the area from which ACM materials are being removed and shall extend 25 feet from the perimeter of the removal area.

D. Non-certified Workers are not allowed in the Work Area until the Work Area is cleared by the Asbestos Project Monitor (APM).

E. Remote personnel decontamination enclosures shall be constructed at a location in accordance with the approved Work Plan. Unless located outside the Work Area, decontamination enclosures are not permitted to be constructed on the roof. Decontamination enclosures shall be constructed as close to the regulated abatement work area as physically possible, but no greater than 50 feet from the building. It shall be cordoned off at a distance of 25 feet to separate it from public areas.

F. All openings (including but not limited to operable windows, doors, hatches, vents, ducts, and grilles) one story above, one story below, and within 25 feet of the work area shall be sealed with two layers of six mil polyethylene. Alternately, a polyethylene drape may be used instead of sealing windows individually where permitted by Code Rule 56.

G. The removal of the ACM may require the use of scrapers, solvents, mastic removal chemicals, or other methods/procedures to ensure complete removal.

H. The Contractor is required to provide temporary protection of the building (i.e. roof, window openings, construction joints, etc.) at the end of each Work shift so as to maintain the building in a watertight condition.

I. All asbestos waste generated shall be containerized in the work area, prior to transfer to waste storage trailer/dumpster. No waste shall remain in the work area at the end of each work shift. All waste shall be disposed of as RACM asbestos waste including projects where waste transfer procedures are modified by Site Specific Variance.

J. Dumpsters used for waste storage shall be lined with two layers of six mil polyethylene and shall have a hard top. Where open-top dumpsters are permitted by ICR 56 or a Site Specific Variance, the top shall be closed with polyethylene flaps that are sealed at the end of each work shift.

K. Personal protective equipment, including respirators, shall be utilized and worn during all removal operations until the Work Area is cleared by the APM.

L. The Owner may, at his discretion, choose to conduct air sampling. If air samples collected during abatement indicate any airborne asbestos fiber concentration(s) at or above 0.01 f/cc, Work shall be stopped immediately and Work methods shall be altered to reduce the airborne asbestos fiber concentration(s).

M. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed:
   1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned.
   2. The APM shall conduct a visual inspection of the Work Area for cleanliness and completeness of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
   3. Upon satisfactory visual inspection results, the isolation and critical barriers shall be removed and bagged as asbestos waste. Following this, the decontamination enclosures shall be removed.

3.13 NON-FRIABLE FLOORING AND/OR MASTIC REMOVALS

A. The following procedures may only be used for the removal of non-friable flooring and/or mastic materials using manual and chemical methods. These procedures shall not apply to beadblaster use or other abrasive abatement methods.

B. The Contractor shall restrict access to the immediate Work Area where non-friable ACM removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Remote personnel decontamination enclosures may be utilized and shall be constructed at a location in accordance with the approved Work Plan. A washroom with attached airlock shall be constructed contiguous to each Work area enclosure.

D. The Work Area shall be prepared per section 3.05, except that ceilings, walls, and floors need not be fully plasticized However, a four-foot high single layer of 6-mil fire retardant plastic sheeting shall be installed as a splashguard at all walls adjoining mastic removal portions of the work area, to prevent damage to the existing walls.

E. Negative air shall be maintained at six (6) air changes per hour.

F. OSHA compliance air monitoring is required per section 1.09.

G. ACM removal shall follow procedures defined in section 3.07.

H. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed in the washroom and double-bagged before being passed into the airlock. The bags or containers shall then be transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.

I. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
   2. All plastic sheeting splashguards shall be removed and containerized, followed by all surfaces in the Work Area being wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
   3. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an

indication for completeness of coverage. The APM shall determine adequacy of coverage.

4. After the waiting/settling/drying time requirements have elapsed, the Asbestos Project Monitor (APM) shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
5. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
6. Upon receipt of satisfactory final clearance air sampling results, the isolation and critical barriers shall be removed and bagged as asbestos waste. Following this and satisfactory inspections by the project supervisor and the APM for cleanliness the decontamination enclosures shall be removed.

3.14 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.

B. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape, staples, and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment.
   1. Finishes unable to be restored shall be replaced under this Contract at the Contractor's expense.
   2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.

C. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where reinsulation is part of the required work.

PART 4 DISPOSAL OF ASBESTOS WASTE

4.01 TRANSPORTATION AND DISPOSAL SITE

A. The Contractor's Hauler and Disposal Site shall be approved by the Owner. All waste generated during the asbestos project shall be disposed of as RACM asbestos waste.

B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. No waste may be taken from the site unless the Contractor and Environmental Consultant are present and the Environmental Consultant authorizes the release of the waste as described herein.

C. All waste generated as part of the asbestos project shall be removed from the site within ten (10) calendar days after successful completion of all asbestos abatement work.

D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Part 364 Asbestos Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority and shall verify that the waste is being transported to the disposal site as listed on the DOL/EPA notifications.

E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Asbestos Waste Shipment Records.

4.02 WASTE STORAGE CONTAINERS

A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.). No open containers will be permitted on-site (i.e. open dumpster with canvas cover, etc.) unless specifically permitted by applicable regulation or a Site Specific Variance. When asbestos contaminated waste must be kept on the work site overnight or longer, it shall be double bagged and stored in accordance with Federal, State, and local laws.

B. The Environmental Consultant shall verify that the waste storage container and/or truck tags (license plates) match that listed on the New York State Department of Environmental Conservation Part 364 permit. Any container not listed on the permit shall be removed from the site immediately.

C. The container shall be plasticized and sealed with two (2) layers of 6 mil polyethylene. Once on site, it shall be kept locked at all times, except during load out. The waste container shall not be used for storage of equipment or contractor supplies.

D. While on-site, the container shall be labeled with EPA Danger signage:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

E. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.

F. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.

G. Waste generated off-site is not permitted to be brought onto the Project site and loaded into the waste container.

H. All asbestos waste removed from the project site shall be transported directly to the disposal site without any additional waste being added to the container during transport.

4.03 OWNER'S AND HAULER'S ASBESTOS WASTE SHIPMENT RECORDS

A. An Asbestos Waste Shipment Record shall be provided by the Owner (Appendix A) and shall be utilized in conjunction with the Asbestos Hauler's Shipment Record.

B. The Owner's Shipment Record and the Hauler's Shipment Record shall be completed by the Contractor and verified by the Environmental Consultant that all the information and amounts are accurate and the proper signatures are in place.

C. The Shipment Records shall have the appropriate signatures of the Environmental Consultant, the Contractor, and the Hauler representatives prior to any waste being removed from the site.

D. Copies of the completed Owner's Shipment Record and the Hauler's Shipment Record shall be retained by the Environmental Consultant and the Contractor and shall remain on site for inspection.

E. Upon arrival at the Disposal Site, the Owner's Shipment Record and the Hauler's Shipment Record shall be signed by the Disposal Facility operator to certify receipt of ACM covered by the shipment record.

F. The Disposal Facility operator shall return the original Owner's Shipment Record and the Hauler's Shipment Record to the Contractor.

G. The Contractor shall forward copies of the Owner's Shipment Record and the Hauler's Shipment Record to the Environmental Consultant within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.

H. The Contractor shall utilize the Waste Disposal Log provided by the Owner (Appendix B.) This log shall be maintained by the Project Supervisor and shall be kept on site at all times.

I. All waste disposal shipment records and disposal logs shall be submitted by the Contractor to the Owner with the final close-out documentation.

APPENDIX A

ASBESTOS WASTE SHIPMENT RECORD

Asbestos Waste Shipment Record
Dormitory Authority State of New York
515 Broadway
Albany, New York 12207-2964

Record No.
A2001

DASNY PROJECT NUMBER: _____
DASNY Project Name: _____
Generator Facility Name: _____
Generator Facility Address: _____
_____
Facility Contact Person: _____ Phone Number: _____

Asbestos Abatement Contractor Firm Name & Address: _____
_____
Contact Person _____ Phone # _____ Asbestos License # _____

Asbestos Consultant/Monitor Firm Name and Address: _____
_____
Contact Person _____ Phone # _____ Asbestos License # _____

Asbestos Abatement Contractor/Consultant Certification: I hereby declare that the contents of this consignment are fully described below and are packed, marked, and labeled in accordance with applicable governmental regulations.
Type of Material:_____
Type & Size of Container: _____ Type of Packaging _____
Asbestos Abatement Contractor Name: _____
Date: _____ Signature: _____
Asbestos Consultant/Monitor Name: _____
Date: _____ Signature: _____

Transporter/Transfer Facility Acknowledgement of Receipt of Material:

Transporter #1 Company Name: _____
Name: _____ Signature: _____
Date & Time of Departure _____ Transporter Permit (NYS DEC #) _____
Tractor License # _____ Trailer License # _____
Discrepancies Noted: _____

Transfer Facility (if applicable) Company Name: _____
Name: _____ Signature: _____
Date & Time of Departure _____ Permit (NYS DEC #) _____
Discrepancies Noted: _____

Transporter #2 (if applicable) Company Name: _____
Name: _____ Signature: _____
Date & Time of Departure _____ Transporter Permit (NYS DEC #) _____
Tractor License # _____ Trailer License # _____
Discrepancies Noted: _____

Disposal Facility Owner or Operator: I hereby certify receipt of the asbestos waste covered by this shipment record including discrepancies noted above.
Name & Address of Disposal Facility: _____
_____
Date & Time of Arrival: _____
Name: _____ Signature: _____

Disposal facility to return completed waste shipment record (white copy) to the Asbestos Abatement Contractor listed above.
White: Owner/DASNY **Green:** Disposal Facility **Canary:** Transporter **Pink:** Consultant **Goldenrod:** Contractor

APPENDIX B

WASTE SHIPMENT RECORD LOG

DORMITORY AUTHORITY STATE OF NEW YORK
WASTE SHIPMENT RECORD LOG

Facility: _____ **Building:** _____

Project: _____ **Project Number:** _____

Asbestos Contractor: _____ **Environmental Consultant:** _____

Load No.	Hauler	NYSDEC #	License Plate No.	Size of Container	Disposal Facility	DATES (Chain of Events)		
						Dptr from Site	Rec'd at Disposal Site	Shipment Record Returned

COMMENTS:

APPENDIX C

CONTRACTOR'S ACKNOWLEDGEMENT STATEMENT

CONTRACTOR'S ACKNOWLEDGEMENT STATEMENT

Re: Abatement of Asbestos Containing Materials

_____
(Project Title)

_____
(Project Location)

_____
(DASNY Project Number)

In consideration of the following individuals' employment in connection with the abatement, handling, and disposal of asbestos containing materials at the referenced project, I hereby certify that the employees: a) have received the medical examinations required by OSHA 29 CFR 1926.1101; b) have been fit tested specifically for respirators used on the Project; and c) have received training as required by OSHA 29 CFR 1926.1101 in the proper handling of asbestos containing materials, including the health implications and risks involved, as well as the use and limitations of the respiratory equipment to be used.

Employee Name	Asbestos Certificate Number
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Supervisor Signature

_____

(Notary block here)

Printed Name

_____

_____
Title

Page ____ of ____

SECTION 028400
NON-LIQUID PCB MATERIAL REMOVAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This demolition, renovation or abatement Project will include the removal and disposal of non-liquid PCB materials (herein referred to as PCB materials) at the Deyo Hall Rehabilitation & Addition Project at SUNY New Paltz, 1 Hawk Drive New Paltz, New York, 12561 - DASNY Project No. 341830.

B. The work shall include but not be limited to the removal of the following.

Floor/Level	Description of Non-Liquid PCB-Containing Material	Approximate Quantity (SF/LF/Unit)
1st, 2nd	Window Glazing Compound (This material also contains asbestos)	500 LF/11 SF
Basement, 1st, 2nd, 3rd	Door Caulk	20 Doors/354 LF
Basement, 1st, 2nd, 3rd	Bathroom Floor Control Joint Caulk	2,100 LF
Basement, 1st, 2nd, 3rd	Exterior Masonry Control joint Caulk	140 SF
1st	Quarry Tile Flooring Control Joint Caulk	80 LF
1st, 2nd, 3rd	Exterior Window Caulk	4 Windows / 46 LF

C. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.

D. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.

E. Working hours shall be as required and approved by the Owner. PCB material removal activities including, but not limited to, work area preparation, gross removal activities, cleaning activities, waste removal, etc. may need to be performed during 'off-hours' (including nights and weekends). In addition, multiple mobilizations may be required to perform the work identified in this project. The Contractor shall coordinate and schedule all Work with the facility and Owner's representative.

1.02 SPECIAL JOB CONDITIONS

A. Any special job conditions are described below.

1.03 PERMITS AND COMPLIANCE

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.

B. Perform PCB related Work in accordance with DEC Hazardous Waste Regulations (6 NYCRR 370-374, i.e. Hazardous Waste Rules), 40 CFR 761, and 29 CFR 1926, as specified herein. Where more stringent requirements are specified, adhere to the more stringent requirements.

C. The Contractor must maintain current licenses or registrations pursuant to DEC and EPA regulations for all Work related to this Project, including the removal, handling, transport, and disposal of hazardous and industrial waste.

D. The Contractor shall be prepared to obtain an EPA ID number if so directed by the Owner.

E. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.04 SUBMITTALS

A. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below, with 1 copy going directly to the DASNY Code Compliance Unit for review and approval prior to the commencement of PCB abatement activities:
   1. Progress Schedule:
      a. Show the complete sequence of abatement activities and the sequencing of Work within each building or building section.
      b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.
   2. Abatement Work Plan: Provide plans that clearly indicate the following:
      a. All Work Areas/containments numbered sequentially.
      b. Entrances and exits to the Work Areas/containments.
      c. Type of abatement activity/technique for each Work Area/containment.
      d. Proposed location and construction of storage facilities and field office.
   3. Disposal Site/Landfill Permit from applicable regulatory agency.
   4. Letter identifying the presence of PCB bulk product waste, with Acknowledgement by the landfill. See section 4.01.A
   5. NYS Department of Environmental Conservation Waste Transporter Permit.

B. On-Site Submittals: Refer to Part 3.01.B for all submittals, documentation, and postings required to be maintained on-site during abatement activities.

C. Project Close-out Submittals: Within 30 days after project completion, the Contractor shall submit 1 copy of the closeout-out submittals listed below to DASNY Code Compliance and 1 copy to the environmental consultant for review and approval prior to the Contractors final payment. Once DASNY Code Compliance approves the close-out submittal, the contractor shall provide three approved sets of the documents (double-sided and bound)_ to DASNY Project Management. DASNY Project Management shall provide the Facility with one copy of the approved closeout submittals.
   1. Copy of all waste disposal manifests and disposal logs. A copy of the executed Hazardous Waste Manifest shall be forwarded to DASNY code compliance. The completed original must go to the facility for their submission to the DEC.
   2. Daily progress log.
   3. Copy of Contractor's Acknowledgment Statement Forms. Original notarized statement shall be sent to DASNY Code Compliance with the closeout submittals.
   4. Disposal Site/Landfill Permit from applicable regulatory agency.
   5. Copy of PCB notification with acknowledgement from the disposal facility/landfill, if applicable.

1.05 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.

B. Agenda for this conference shall include but not necessarily be limited to:
   1. Contractor's scope of Work, Work plan, and schedule to include number of workers and shifts.
   2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
   3. Environmental Consultant's duties, functions, and authority.
   4. Contractor's Work procedures including:
      a. Methods of job site preparation and removal methods.
      b. Disposal procedures.
      c. Cleanup procedures.
      d. Fire exits and emergency procedures.
   5. Contractor's required pre-work and on-site submittals, documentation, and postings.
   6. Contractor's plan for twenty-four (24) hour Project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
   7. Temporary utilities.
   8. Handling of furniture and other moveable objects.
   9. Storage of removed PCB materials.
   10. Waste disposal requirements and procedures.

C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.06 APPLICABLE STANDARDS AND REGULATIONS

A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:

B. Federal Regulations:
   1. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
   2. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
   3. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
   4. 29 CFR 1926, "Construction Industry" (OSHA)
   5. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
   6. 40 CFR 761, "PART 761—POLYCHLORINATED BIPHENYLS (PCBs)" (EPA)
   7. 49 CFR 171-173, Transportation Standards (DOT)

C. New York State Regulations:
   1. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
   2. 6 NYCRR, Parts 370-373, "Hazardous Waste Management System"

D. Standards and Guidance Documents:
   1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection

1.07 PROJECT MONITORING

A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the PCB abatement Project and provide direction as required throughout the entire abatement Project period.

B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.

C. The Consultant shall provide the following administrative services:
   1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
   2. Assure that all notifications to governmental agencies or landfills by the Contractor are submitted in a timely manner and are correct in content.
   3. Review and approve the Contractor's compliance testing laboratory.

D. The Consultant shall staff the Project with a trained and certified person(s) to act on the Owner's behalf at the job site. This individual shall be designated as the Abatement Project Monitor (APM).
   1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site (except for inspection and planning purposes during non-working days).
   2. The APM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The APM shall have the authority to Stop Work when gross Work practice deficiencies or unsafe practices are observed.
      a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
      b. Standby time required to resolve the situation shall be at the Contractor's expense.
   3. The APM shall provide the following services:
      a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
      b. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
      c. Monitor, verify, and document all waste load-out operations.
      d. The APM shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities, and occurrences.
      e. The APM shall take air, swipe, wipe, or bulk samples upon the Owner's request.
   4. The following inspections shall be conducted by the APM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the APM.
      a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
      b. Pre-Commencement Inspection: This inspection shall take place only after the Work Area is fully prepped for removal.
      c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the APM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.
      d. Visual Clearance Inspection: The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible PCB material debris/residue remains.
      e. Punch List Inspection: The purpose of this inspection is to verify the Contractor's certification that all Work has been completed as contracted and the existing condition of the area prior to its release to the Owner.
   5. The Owner may, at his discretion, choose to conduct air sampling. If air samples collected during abatement indicate any airborne PCB concentration(s) above the

OSHA PEL of 0.5 mg/m^3 or EPA recommended thresholds, work shall be stopped immediately and Work methods shall be altered to reduce the airborne PCB concentration(s).

1.08 PROJECT SUPERVISOR

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
   1. The Project Supervisor shall be trained in PCB removal and hazardous waste management in NYS, via a 40-hour HAZWOPER/Supervisor training course.
   2. The Project Supervisor shall have a minimum of one year experience as a supervisor.
   3. The Project Supervisor must be able to read and write English fluently, as well as communicate in the primary language of the Workers.

B. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Environmental Consultant. The Project Supervisor shall be removed from the Project if so requested by the Owner.

C. The Project Supervisor shall maintain a bound Daily Project Log that includes the Waste Disposal Log required by section 4.03 of the specifications.

D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the APM.

1.09 TRAINING

A. As required by applicable regulations, prior to assignment to PCB Work instruct each employee with regard to the hazards of PCB, safety and health precautions, and the use and requirements of protective clothing and equipment.

B. Employees managing Hazardous Waste as described in Section 3.03 must also meet the Personnel training requirements in section 6 NYCRR 373-3.2.

1.10 RESPIRATORY PROTECTION

A. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134. Provide respirator training.

B. Select respirators from those approved by the Mine Safety and Health Administration (MSHA), and the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134.

C. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual.

D. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day.

E. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.

1.11 DELIVERY AND STORAGE

A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.

B. Store all materials at the job site in a suitable and designated area.
   1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
   2. Protect materials from unintended contamination and theft.
   3. Storage areas shall be kept clean and organized.

C. Remove damaged or deteriorated materials from the job site. Materials contaminated with PCB shall be disposed of as PCB material as specified herein.

1.12 TEMPORARY UTILITIES

A. Where available, obtain power from Owner's existing system. Otherwise provide power from other sources (i.e. generator).
   1. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
   2. Provide wiring and receptacles as required by the Environmental Consultant for air sampling equipment.

B. Provide temporary lighting for all Work Areas.
   1. The entire Work Area shall be kept illuminated at all times.
   2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.

C. Utilize domestic water service, if available, from Owner's existing system.

PART 2 PRODUCTS

2.01 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, and foot coverings. Provide disposable plastic or rubber gloves, suitable to prevent PCB skin contact, to protect hands.

B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.

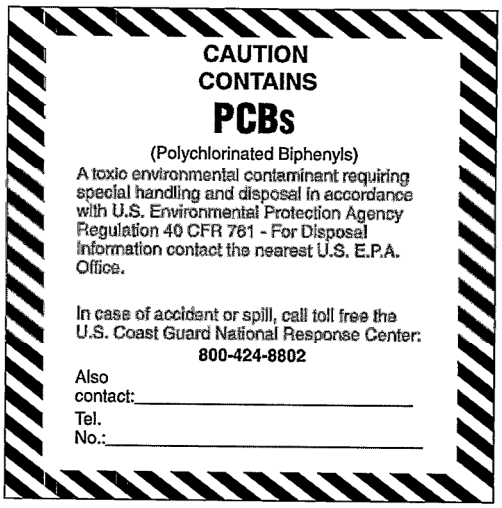
D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

2.02 SIGNS AND LABELS, CONTAINERS

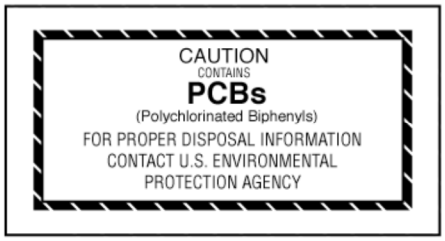
A. Provide warning signs and barrier tapes at all approaches to PCB Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.

B. Provide the appropriate “Large PCB Marking” or “Small PCB Marking” (M_L or M_S per 40 CFR 761) as shown below, of sufficient size to be clearly legible, for display on waste containers (bags, boxes, rolloffs or drums) which will be used to contain or transport PCB contaminated

material, in accordance with 40 CFR 761. In addition, U.S. Department of Transportation (DOT) 49 CFR Parts 171 and 172 requires the name and UN number of the material to be on the bags or drums, and, if shipped in bulk (rolloffs, Gaylord boxes, etc) the bulk container must also be labeled: Polychlorinated biphenyl, solid mixture UN 3432.



M_L



M_S

C. The PCB materials are also NYS Hazardous Waste, and must have a label stating the following on each container :

HAZARDOUS WASTE--Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority, or the U.S. Environmental Protection Agency.

Generator's Name and Address_____
Generator's EPA Identification Number_____
Manifest Tracking Number _____

D. Provide 6 mil plastic disposal bags with PCB caution labels.
   1. The "Small PCB Label" (M_S per 40 CFR 761) may be used as shown above. Bags shall also be labeled with U.S. DOT required markings per 49 CFR 172, Polychlorinated biphenyl, solid mixture UN 3432.
   2. Labeled PCB waste containers or bags shall not be used for non-PCB waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as PCB waste.

2.03 DAILY PROJECT LOG

A. Provide a Daily Project Log. The log shall contain on title page the Project name, name, address and phone number of Owner; name, address and phone number of Environmental Consultant; name, address and phone number of Abatement Contractor; emergency numbers including, but not limited to local Fire/Rescue department.

B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.

C. The Project Supervisor shall document all Work performed daily and note all inspections.

2.04 SCAFFOLDING AND LADDERS

A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler,

tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.

B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.05 SHIPPING CONTAINERS AND PACKAGING

A. Provide packaging in accordance with 49 CFR 173 Packaging Group 9, such as 30 or 55 gallon capacity fiber, plastic, or metal drums, Gaylord Boxes or other Intermediate Bulk Containers (IBCs), or non-siftable bulk containers, capable of being sealed air and water tight if PCB waste has the potential to damage or puncture disposal bags. Affix PCB caution labels on lids of drums, and opposite sides of drums or bulk containers, as well as the ends of bulk containers.

2.06 EQUIPMENT AND MATERIALS

A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Air (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

B. Any power tools used to drill, cut into, or otherwise disturb PCB material shall be manufacturer equipped with HEPA filtered local exhaust ventilation.

C. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire retardant sheeting.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Should visible PCB debris be observed outside the Work Area, immediately stop Work notify the Owner; institute emergency procedures as directed. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

B. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities at a location approved by the Abatement Project Monitor:
1. NYS Department of Environmental Conservation Waste Transporter Permit.
2. Project documents (specifications and drawings.)
3. Applicable regulations.
4. Material Safety Data Sheets of supplies/chemicals used on the Project.
5. Approved Abatement Work Plan.
6. List of emergency telephone numbers.
7. Waste Disposal Log.
8. Daily Project Log.

C. The following documentation shall be maintained on-site by the Abatement Project Monitor during abatement activities:
1. Project Monitor Daily Log.
2. PCB Survey Report.

3.02 WORK AREA PREPARATION

A. PCB caution signs shall be posted at all approaches to the PCB Work Area. Post all emergency exits as emergency exits only on the Work Area side, post with PCB caution signs on the non-Work Area side. Provide all non-Work Area stairs and corridors accessible to the PCB Work Area with warning tapes at the base of stairs and beginning of corridors. Warning tapes shall be in addition to caution signs.

B. Access to areas of work shall be regulated to prevent unauthorized visitors.

C. Personal/Equipment Decontamination Room or Area. An existing room or area that is adjacent to the work area shall be used for the decontamination of personnel and equipment. The room or area shall be covered by an impermeable dropcloth on the floor or horizontal working surface. The room or area must be of sufficient size to accommodate cleaning of equipment and removing personal protective equipment. Work clothing must be cleaned with a HEPA vacuum before it is removed. All equipment and surfaces of waste containers must be cleaned prior to removing them from the decontamination room or area. All personnel must enter and exit the PCB work area through the decontamination room or area.

D. Work Area Preparation For Exterior Removal:
   1. All ground surfaces exterior to the work area shall have a layer of 6 mil fire retardant plastic sheeting, attached to the building face and laid down on the surface below the exterior abatement work area, at least 10 feet wide or to the furthest point of gravity fall for dislodged debris by methods used, whichever is further. For work at the second story and above, extend 6 mil fire retardant plastic sheeting as necessary. For work above third story, by sidewalk, street, or property boundary, scaffolding sides shall be covered in 6-mil fire retardant plastic sheeting.
   2. All operable windows within the work area and 25 ft. from all sides of the work area shall be closed.
   3. In the work area, isolate all HVAC equipment intakes by temporarily shutting down units during removals and installing plastic sheeting over the opening.

E. Work Area Preparation For Interior Removal:
   1. Isolate all HVAC equipment, including installing plastic sheeting on all air returns and exhausts. Turn off all HVAC systems serving work area when feasible.
   2. All floor areas adjacent to the work area shall have a layer of 6 mil fire retardant plastic sheeting, attached to the interior wall and laid down on the surfaces below the abatement work area, at least 5 feet wide or to the furthest point of gravity fall for dislodged debris by methods used, whichever is further.
   3. All movable objects shall be removed from the immediate work area. All non-movable objects shall be covered with one layer of 6 mil fire retardant plastic sheeting and sealed at the edges.
   4. All operable windows within the work area shall be closed.
   5. Temporary dust barriers consisting of a minimum of 6-mil fire-retardant plastic sheeting shall be at installed at hallways, corridors, doorways, and other openings to the work area not used for passage during removals) to establish work area containment enclosure.
   6. A 6-mil fire retardant plastic sheeting overlapping curtained doorway shall be installed at the entrance to the work area.
   7. For all work areas with use of electromechanical tools for PCB removals, HEPA filtered negative air ventilation units must be installed in work area and operate continuously during removal operations to establish negative pressure. A minimum of 4 air changes per hour must be maintained within work area during removals and cleanings until work area clearance is obtained from the APM.

3.03 REMOVAL OF PCB MATERIALS - GENERAL

A. PCB-containing materials shall be removed in accordance with the Contract Documents and the approved PCB Work Plan.

B. Non-PCB items remaining such as windows, doors, masonry, and all other building construction and components from which PCB materials are removed shall be decontaminated by physical or chemical means (such as stripper) such that no visible residue remains. The removal of the PCB materials may require the use of scrapers, solvents, mastic removal chemicals, or other methods/procedures to ensure complete removal.

C. Use tools that generate the least amount of dust and will still complete the PCB caulk removal. See current EPA regulations and recommendations regarding tools and protective measures to be used for PCB caulk removals.

D. Grinding electromechanical tools (e.g. angle grinders, masonry groove cutters, circular saws, and slot mills, etc.) are not allowed to be used for exterior open-air PCB caulk removals.

E. For exterior removals, take appropriate precautions (e.g. install windscreens) to prevent dust and debris from migrating due to windy conditions.

F. Remove accessible caulk that could be disturbed before cutting building components, such as window frames.

G. All removed PCB material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate. Large components with PCB material or PCB residue shall be wrapped in one layer of 6 mil plastic sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.

H. Power or pressure washers are not permitted for PCB removal or clean-up procedures

I. All construction and demolition debris determined by the Environmental Consultant to be contaminated with PCB shall be handled and disposed of as PCB waste. If non-porous (e.g. metal) removed components previously in contact with non-liquid PCBs are to be cleaned and decontaminated prior to disposal as non-PCB waste, the requirements of 40 CFR 761 Subpart D shall be met, including cleaning to Visual Standard No. 2, Near-White Blast Cleaned Surface Finish of the National Association of Corrosion Engineers (NACE). The project monitor shall verify compliance with Standard No. 2, by visually inspecting all cleaned removed components. The Contractor shall note that a near-white metal blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter.

J. All PCB waste must be located at or near the point of generation, under the control of the Project Supervisor. Up to 55 gallons may be stored at the point of generation for an indefinite period, but any more than 55 gallons must be moved within 3 days to a Container storage area (CSA) as specified in 6 NYCRR Section 372.2 "Standards Applicable to Generators of Hazardous Waste", or off site. Waste may be stored at the CSA for 90 days, during which labeling, inspections, and other requirements must be met as described in 6 NYCRR Section 372.2, Section 373-3.1(d) and Subpart 373-3.

K. The CSA and personnel managing it must also meet the following requirements of 6 NYCRR 373:
   1. Preparedness and Prevention provisions of Section 373-3.3
   2. Secondary containment requirements of 373-2.9(f)(1)
   3. Personnel training in section 373-3.2

4. Contingency plans and emergency procedures in section 373-3.4 subparagraph 376.1(g)(1)(v)
5. The containers must be dated when placed in storage, and accumulation times must be observed
6. The total amount of hazardous waste stored in the storage area at one time is 13,200 lb.
7. A label or sign stating "Hazardous Waste" must identify all areas and containers used to accumulate hazardous waste

L. Closure of the CSA. If an EPA ID number and CSA were created specifically for the PCB removal work, once the removal work is complete the Contractor shall immediately close out the CSA, notify the DEC/EPA that the hazardous waste activity has concluded, and that the storage area is to be closed per 373-3.7(b) and (e).

M. The Contractor is required to provide temporary protection of the building (i.e. roof, window openings, construction joints, etc.) at the end of each Work shift so as to maintain the building in a watertight condition.

N. Personal protective equipment, including respirators, shall be utilized and worn during all removal operations until the Work Area is cleared by the APM.

O. Following completion of gross abatement and after all accumulations of PCB waste materials have been containerized, the decontamination procedures in Section 3.04 shall be followed.

P. Finishes damaged by PCB abatement activities shall be restored prior to final payment. Finishes unable to be restored shall be replaced under this Contract.

Q. Dry sweeping and any other methods that raise dust shall be prohibited.

3.04 EQUIPMENT AND AREA DECONTAMINATION

A. When removal of PCB materials is completed, the decontamination process shall consist of vacuuming (with a HEPA filter), wet wiping/mopping and a repeated vacuuming (with a HEPA filter) of the entire work area. All surfaces in and around the work area must be free of dust generated during the work.

B. Decontaminate all tools and equipment before removal from the work area.

C. If dust or debris has migrated to areas of the building other than the immediate work area, those areas shall be incorporated into the work area and thoroughly decontaminated to ensure all visible dust generated by the activity is eliminated.

D. Uncontaminated dust barriers and other protective sheeting shall be placed in disposable construction bags and disposed of as normal trash.

E. Visually inspect the area for any remaining dust or debris. Vacuum (with HEPA filter) and wet wipe until space is clean. Dispose of vacuum contents as PCB waste.

F. Upon completion of decontamination and removing temporary dust barriers, a final inspection shall be performed by the Contractor and Abatement Project Monitor. As a result of any visual inspection by the Abatement Project Monitor, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

PART 4 DISPOSAL OF PCB WASTE

4.01 TRANSPORTATION AND DISPOSAL SITE

A. The Contractor's Hauler and Disposal Site shall be approved by the Owner. For any permitted out-of-state landfill not specifically authorized for disposal of PCBs, written notice must be provided 15 days prior to the first shipment of the same waste stream that the waste may contain PCBs greater than 50ppm, in accordance with 40 CFR 761.62. The letter shall be acknowledged via a disposal facility representative's signature, printed name and title. If the facility is permitted to accept PCB waste, no letter is required. Note: For disposal within New York State, facilities must be specifically permitted to accept PCB waste.

B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. No waste may be taken from the site unless the Contractor and Environmental Consultant are present and the Environmental Consultant authorizes the release of the waste as described herein.

C. All waste generated as part of the PCB project shall be removed from the site within ten (10) calendar days after successful completion of all PCB abatement work.

D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Part 364 Waste Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority.

E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Hazardous Waste Manifests.

4.02 WASTE STORAGE CONTAINERS

A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.).

B. The Environmental Consultant shall verify that the waste storage container and/or truck tags (license plates) match that listed on the New York State Department of Environmental Conservation Part 364 permit. Any container not listed on the permit shall be removed from the site immediately.

C. The container shall be plasticized and sealed with one layer of 6 mil plastic. Once on site, it shall be kept locked at all times, except during load out. The waste container shall not be used for storage of equipment or contractor supplies.

D. While on-site, the container shall be labeled with PCB Warning Labels and DEC Hazardous Waste Labels as specified in Section 2.02.

E. The New York State Department of Environmental Conservation Waste Hauler's Permit number shall be stenciled on both sides and back of the container.

F. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.

G. The Owner may initiate random checks at the Disposal Site to insure that the procedures outlined herein are complied with.

H. All waste streams (asbestos/PCBs/hazardous/universal/C&D debris, etc.) generated during this project shall be properly segregated and stored in separate distinct areas. Wastes shall not be comingled.

4.03 HAZARDOUS WASTE MANIFESTS

A. A New York State Uniform Hazardous Waste Manifest shall be utilized solely as the waste Manifest for transportation. A hauler billing form or bill of lading may be used if the hauler needs an independent record, but shall not be used as a shipping document.

B. The Manifest shall be completed by the Contractor and verified by the Environmental Consultant that all the information and amounts are accurate and the proper signatures are in place.

C. The Manifest shall have the appropriate signatures of the Owner's Representative (the Generator) and the Hauler representative prior to any waste being removed from the site.

D. Copies of the completed Manifest shall be retained by the Environmental Consultant and shall remain on site for inspection.

E. Upon arrival at the Disposal Site, the Manifest shall be signed by the Disposal Facility operator to certify receipt of PCB materials covered by the manifest.

F. The Disposal Facility operator shall return the original Manifest to the Owner's Representative (the Generator) as required by the DEC in 6 NYCRR 372 within 45 days. The Environmental Consultant must call the facility to investigate if not returned within 35 days, and call the DEC and file an Exception report if not returned within 45 days.

G. The Contractor shall utilize the Waste Disposal Log provided by the Owner. This log shall be maintained by the Project Supervisor and shall be kept on site at all times. (See Appendix A.)

H. Originals of all waste disposal manifests disposal logs shall be submitted by the Contractor to the Owner with the final close-out documentation.

I. The Contractor must also submit reports and records per the requirements of 6 NYCRR 372.2.

APPENDIX A

WASTE MANIFEST LOG

DORMITORY AUTHORITY STATE OF NEW YORK
WASTE MANIFEST LOG

Facility: _____ **Building:** _____

Project: _____ **Project Number:** _____

PCB Contractor: _____ **Environmental Consultant:** _____

Load No.	Hauler	NYSDEC #	License Plate No.	Size of Container		DATES (Chain of Events) Departed from Site	Rec'd at Disposal Site	Manifest Returned

COMMENTS:

APPENDIX B

CONTRACTOR'S ACKNOWLEDGEMENT STATEMENT

DASNY | WE FINANCE, BUILD AND DELIVER.
DORMITORY AUTHORITY STATE OF NEW YORK

CONTRACTOR'S ACKNOWLEDGEMENT STATEMENT

Re: Abatement of Non-Liquid PCB Materials

_____
(Project Title)

_____
(Project Location)

_____
(DASNY Project Number)

In consideration of the following individuals' employment in connection with the abatement, handling, and disposal of Non-Liquid PCB Materials at the referenced project, I hereby certify that the employees: a) have received the medical examinations required by OSHA 29 CFR 1926.134; b) have been fit tested specifically for respirators used on the Project; and c) have received training in the proper handling of Non-Liquid PCB materials, including the health implications and risks involved, as well as the use and limitations of the of personal protective equipment to be used.

Employee Name	Social Security Number (last four digits)	State Driver License ID#
_____	_____	
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
		_____

Supervisor Signature

_____

(Notary block here)

Printed Name

_____

_____
Title

SECTION 028600
IDENTIFICATION AND DISPOSAL OF HAZARDOUS WASTE

PART 1 - GENERAL

A. Description Of Work
   1. This specification covers the identification and disposal of hazardous waste, and related hazardous materials. Products shall be as follows or as directed by the Owner and or their representative. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
   2. Special Wastes:
      a. Asbestos-Containing Materials (ACM): ACM is regulated by EPA TSCA Rules, NY Code Rule 56 and OSHA standards, and is not Hazardous Waste.
      b. PCB Bulk Waste and non-liquid PCB materials (NLPCB): Window caulk and other caulk may contain NLPCB; if so, when disposed these materials are EPA-regulated PCB Bulk Waste under TSCA, and are NYS hazardous waste. PCB light ballasts are also to be disposed of as NYS Hazardous Waste.

      This Project will include, but not be limited to, the proper removal and disposal of the following materials from the Deyo Hall Rehabilitation & Addition Project at SUNY New Paltz, 1 Hawk Drive New Paltz, New York, 12561 - DASNY Project No. 341830:

      - PCB, DEHP, and/or electronic ballasts. Ballasts that do not include "NO-PCBs" on ballast label should be assumed to contain PCBs.

      Refer to electrical demolition drawings for locations and to scale quantities.

B. Definition
   1. Hazardous waste shall be any materials to be disposed that possess at least one of four characteristics, ignitability, corrosivity, reactivity or toxicity, as defined and regulated by the Resource Conservation and Recovery Act (RCRA) and applicable state and federal regulations, or a material specifically identified as hazardous waste by applicable Federal or State lists, in 40 CFR 261 or 6 NYCRR 371.
   2. A Conditionally Exempt Small Quantity Generator (CESQG) of hazardous waste shall be a waste handler who generates no more than 100 kilograms per month of listed and/or characteristic hazardous waste, generates no more than 1 kilogram of acute hazardous waste in any calendar month, and stores no more than 1000 kilograms of listed and/or characteristic hazardous waste or more than 1 kilogram of acutely hazardous waste.
   3. A Small Quantity Generator (SQG) of hazardous waste shall be a waste handler who generates no more than 1000 kilograms per month of listed and/or characteristic hazardous waste, generates no more than 1 kilogram of acute hazardous waste per month, and stores no more than 6000 kilograms of listed and/or characteristic hazardous waste or more than 1 kilogram of acutely hazardous waste.
   4. Large Quantity Generator (LQG) of hazardous waste shall be a waste handler who generates more than 1000 kilograms per month of listed and/or characteristic hazardous waste, generates more than 1 kilogram of acute

hazardous waste per month, or stores more than 6000 kilograms of hazardous waste or 1 kilogram of acutely hazardous waste.

5. The Owner's Consultant: The Owner shall provide a third party consultant to provide pre-work assessments, project monitoring assessments for the construction procedures for the work area and surrounding areas and final clearance assessments. The Contractor shall be responsible for the worker protection requirements.

C. Submittals

NOTE: Submittals will not be considered acceptable for review unless they are submitted as a complete package including all specified information. All information shall be submitted in the order listed in this section. Include title pages to identify the information included in the distinct sections. If any of the specified information is not included, contractor shall include a page acknowledging the specified information, and an explanation as to why the information is not included. Pre-work submittals shall be submitted at least seven (7) days prior to the commencement of work.

1. Before start of work: At the pre-construction meeting, the Contractor shall submit the following to the Owner's Representative for review:
   a. Copy of State or local license for hazardous waste hauler.
   b. Certificate of at least one on-site supervisor which has satisfactorily completed the OSHA 40 hour Health and Safety course for handling hazardous waste and spills.*
   c. Schedule of start and finish times and dates for this work.
   d. The name, address and EPA ID No. of the disposal facility where these waste materials are to be received. Include contact person, a copy of the facility permit and telephone number. The facility permit must identify the waste material(s) to be received, and must be accompanied by a statement that the facility has the capacity and authority to accept the waste. Land Disposal Restriction (LDR) forms must also be provided.
   e. Material Safety Data Sheet (MSDS) for all materials to be removed.
   f. If the Contractor introduces any chemical into the work environment, a MSDS for that chemical must be presented to the Owner's Representative prior to use.

2. Do not start work until pre-work submittals are returned with the Owner's Representative stamp indicating that the submittal is returned for unrestricted use.

3. On-Site Submittals: Maintain the following on-site during abatement activities:
   a. Certificates of workers, which have successfully completed the OSHA 40-Hour Health and Safety Course for Hazardous Waste and spills.*
   b. List of the employees performing this work.

D. Regulatory Requirements

1. All activities related to the work shall be conducted in compliance with all applicable laws, regulations, and requirements which may include, but not be limited to, the United States Environmental Protection Agency (US EPA), United States Department of Transportation (US DOT), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Administration (OSHA), New York State Department of Environmental

Conservation (NYS DEC), New York City Department of Environmental Protection (NYC DEP), and New York City Fire Department.

2. The Contractor is required to secure and maintain all required regulatory permits necessary to perform all aspects of the work.
3. The Contractor shall containerize and store waste in accordance with all applicable regulations. All containers are to be appropriately marked/labeled.

PART 2 PRODUCTS

A. Materials
   1. Drums: Recovery or salvage drums acceptable for disposal of hazardous waste. Prior approval of drums is required. Drums or containers must meet the required OSHA, EPA (40 CFR Parts 260-264 and 300), and DOT Regulations (49 CFR Parts 171-178). Use of damaged containers shall not be allowed.
   2. Labels: As required by the EPA and OSHA for handling, transportation, and disposal of hazardous waste.
   3. Absorbent Material: Clay, soil or any commercially available absorbent used for the purpose of absorbing hazardous or potentially hazardous materials.

PART 3 EXECUTION

A. All waste shall be stored, handled, transported and disposed of in accordance with all federal, state and local guidelines and regulations. The Contractor is to obtain all permits, licenses, etc., which are necessary for the storing, transporting and disposing of hazardous waste. The Contractor shall develop all applicable manifests, Profile Sheets, Land Ban Forms and any other documentation and co-ordinate with the Owner regarding proper signatures. The Contractor may be required to notify the EPA of the hazardous waste activities, and obtain an EPA identification number specifically for the project, if one is not available.

B. The Contractor shall identify and classify the hazardous waste generated through the performance of the work as per the governing regulations, and in accordance with the Waste Sampling Plan submittal from Section 1.1 above. The Contractor shall conduct the required sampling and chemical analysis for handling, storing, transporting and disposing of the hazardous waste.

C. The Contractor is responsible for securing appropriate treatment or disposal for the waste streams at a permitted TSDF, in compliance with all requirements, and for obtaining a copy of the waste manifest as executed by the TSDF. If the manifest is not returned within the required time, the contractor shall notify the Owner and the NYS DEC, and initiate an investigation as required.

D. Transporters shall maintain waste manifest and shipment record forms. All transporters are required to obtain and maintain NYS DEC Part 364 Waste Transporter permit and, if applicable, a NYC Fire Department permit for transporting flammables. The Part 364 Permit shall have the license plate number of the vehicle, the expiration date of the permit, the type of waste the hauler can take and the treatment, storage and disposal (TSD) facility to which the hauler can take the waste. The transporter must also have all applicable, current waste transportation permits for states where proposed disposal facility is located.

E. The Contractor shall supply all required placard and labeling, and shall have an appropriately trained individual to prepare and sign the hazardous waste manifest, as the DOT shipper.

F. The Contractor shall furnish all certified copies of manifests (interim storage and final disposal) within regulatory requirements. Within 30 days from the acceptance of the waste by the disposal facility, the Contractor shall provide the Owner with Certificate of Disposal documents, as a requirement for final payment.

G. Unless directed otherwise, the Contractor shall file the annual report and fee report if applicable for the hazardous waste shipped, and provide closure notification to EPA and DEC immediately upon completion of the work.

*HAZWOPER Training is not required if the waste is PCB Bulk waste alone, but OSHA HAZCOM and TSCA training are still required.

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SECTION 028700
REMOVAL AND DISPOSAL OF UNIVERSAL WASTE AND FLUORESCENT LAMPS

PART 1 - GENERAL

A. Description Of Work

1. This specification covers the removal and disposal of Universal waste, including fluorescent lamps, high-intensity discharge (HID) lamps, mercury thermostats and switches, batteries and pesticides (not lighting ballasts). Removed or replaced mercury thermostats shall be recycled as per current NYS DEC regulations, instead of disposal as Universal Waste. Demolition and removal of materials shall be as required to support the work.

   This Project will include, but not be limited to, the proper removal and disposal of the following materials from the Deyo Hall Rehabilitation & Addition Project at SUNY New Paltz, 1 Hawk Drive New Paltz, New York, 12561 - DASNY Project No. 341830:

   - 4' fluorescent lamps (all lamps within project limits); and
   - Compact fluorescent lamps (all lamps within project limits).

   Refer to electrical demolition drawings for locations and to scale quantities.

B. Submittals

   NOTE: Submittals will not be considered acceptable for review unless they are submitted as a complete package including all specified information. All information shall be submitted in the order listed in this section. Include title pages to identify the information included in the distinct sections. If any of the specified information is not included, contractor shall include a page acknowledging the specified information, and an explanation as to why the information is not included. Pre-work submittals shall be submitted at least seven (7) days prior to the commencement of work.

1. Before Start of Work: Submit the following to the Owner's Representative for review. Do not start work until these submittals are returned with Owner's Representative's approval.
   a. Copy of State or local license/permit for hazardous waste hauler;
   b. Certification of at least one on-site supervisor which has satisfactorily completed the OSHA 40 Hour Health and Safety Course for Handling Hazardous Materials;
   c. Schedule of start and finish times and dates for this work;
   d. Name and address of the universal waste handler or a destination facility where the waste materials is to be treated, deposited or recycled in accordance with all regulatory requirements (include contact person and telephone numbers), if the universal waste meets the definition of hazardous waste, the name and address of the hazardous waste treatment, storage and disposal (TSD) facility, the name and address of the mercury thermostat recycling collection site;
   e. If Contractor introduces any chemical into the work environmental, a MSDS for that chemical is required before use;

f. Contingency Plan for handling emergency spills or leaks;

2. On-Site Submittals: Maintain the following on-site during abatement activities:
   a. Certificates of workers which have successfully completed at least the OSHA 40-Hour Health and Safety Course for Hazardous Materials;
   b. Certificates of workers which have successfully completed the required employee training for universal waste or appropriate type of training to the type of wastes being managed;

3. After the universal waste has been removed from the site, provide a record of all universal waste shipments received and sent offsite from the project.

C. Definitions
   1. Large Quantity Handler (LQH) of Universal Waste shall be a waste handler who accumulates 5,000 kilograms or more of universal waste (batteries, pesticides, thermostats, or lamps, calculated collectively) at any time. This designation as a large quantity handler of universal waste is retained through the end of the calendar year in which 5,000 kilograms (11,000 pounds) or more total of universal waste is accumulated. The LQH shall notify the EPA, acquire or co-ordinate with a facility regarding an EPA identification number, and provide records for each shipment. The LQH shall ensure all employees are thoroughly familiar with proper waste handling and emergency procedures, relative to their responsibilities during normal facility operations and emergencies.
   2. Small Quantity Handler of Universal Waste (SQH) shall be a waste handler who does not accumulate 5,000 kilograms (11,000 pounds) or more of total universal waste (batteries, pesticides, thermostats, or lamps, calculated collectively) at any time.
   3. Destination Facility shall be a facility that legitimately and can legally accept universal waste from offsite so that the universal waste can be treated, disposed, or recycled in accordance with the regulatory requirements.
   4. Universal Waste Transporter shall be anyone who transports universal waste. In New York, universal waste transporters that transport greater than 500 pounds of universal waste in a single shipment must be a permitted hazardous waste transporter pursuant to Federal and State regulations. Proper notification with the receiving handler agreeing to receive the shipment is required by the Universal Waste Transporter.
   5. Universal Waste consists of the following discarded materials, as identified in 6 NYCRR 374-3: Fluorescent light bulbs high-intensity discharge (HID) lamps, mercury thermostats and switches, batteries, and pesticides. Removed or replaced mercury thermostats must be delivered to a designated mercury thermostat collection site as per current NYC DEC regulations. Disposal of mercury thermostats in a solid waste management facility is prohibited. PCB ballasts/capacitors from light fixtures shall not be treated as universal waste, they shall be handled and disposed of as hazardous waste. See the Hazardous Waste Disposal Specification for these wastes.

PART 2 PRODUCTS

A. Materials
   1. Polyethylene Sheet: A single polyethylene film in the largest sheet size possible to minimize seams, 6.0 mil thick, clear, frosted, or black.

2. Duct Tape: Provide duct tape in 3" widths, witty an adhesive which is formulated to stick aggressively to sheet polyethylene.
3. Spray Cement: Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.
4. Disposal Bags: Provide 6 mil thick leak-tight polyethylene bags.
5. Labels: As required by the EPA and OSHA for handling, transportation, and disposal of hazardous waste.
6. Drums: Recovery or salvage drums acceptable for disposal of hazardous waste. Prior approval of drums is required. Drums or containers must meet the required OSHA EPA (40 CFR Parts 264265 and 300), and DOT regulations (49 CFR Parts 171-178). Use of damaged drums will not be allowed.

PART 3 EXECUTION

A. Universal Waste
1. Employee training shall ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relative to their responsibilities during normal operations and emergencies and to the type of waste they are handling.
2. Mercury thermostats shall be segregated from other Universal Wastes to allow for required recycling.
3. Once the properly labeled containers holding the universal waste have been filled and sealed, they shall be stored in designated accumulation areas as agreed upon by the Owners Representative and Contractor. They shall not be allowed to store in transportation vehicles, or onsite for more than one year from when the waste has been generated.
4. Documentation when a universal waste in storage was first accumulated shall be provided. This is to be done by dating and labeling the waste with the date of the earliest accumulation that can document the length of time the universal waste has been accumulated.
5. Maintenance of an inventory system on-site that identifies the earliest date that any universal waste in a group of universal waste items or a group of containers of universal waste became a waste was received.
6. Any waste developed from the work that exhibits one or more characteristics of hazardous waste, that are not specifically identified by EPA and DEC as Universal Waste, must be handled accordingly and not as a universal waste. See the Hazardous Waste Disposal Specification for those wastes.

B. Off-Site Shipment of Universal Waste
1. Off-Site shipments shall meet the requirements for offsite shipments and is prohibited from sending or taking universal waste to a place other than a designated universal waste handler or a universal waste destination facility.
2. LQH's of universal waste must notify EPA in writing and develop an EPA identification number or co-ordinate with the facility regarding use of their EPA identification number, prior to exceeding 5,000 kilograms of universal waste onsite.
3. SQH's do not need to notify EPA, receive an EPA identification number or keep records of shipments of universal waste.
4. LQH's must keep a record of all universal waste shipments received or sent offsite, and must retain those records for at least three years from the date of receipt or shipment. Records may include invoices, manifests, logs, bills or lading, or other shipping documents.

5. The Contractor shall provide certified copies of all receipts obtained from designated mercury thermostat recycling collection sites within 30 days of thermostat acceptance by collection site.
6. The Contractor shall furnish all certified copies of manifests (interim storage and final disposal) within regulatory requirements. Within 30 days from acceptance of the waste by the disposal facility, the Contractor shall provide the Owner with Certificate of Disposal documents, as a requirement for final payment.

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SECTION 030132
FIBER REINFORCED POLYMER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Installation of externally bonded fiber reinforced polymer (FRP) laminates to reinforce concrete structures, including slabs, walls, and columns.

B. Work including: Furnishing of materials, labor, equipment, and all items necessary for repair of existing concrete members and strengthening by the application of externally bonded FRP reinforcement as specified in the contract drawings and specifications.

1.3 REFERENCE STANDARDS

A. ACI318-08 – Building Code Requirements for Structural Concrete.

B. ACI 440.2R-08 – Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures.

C. ACI440R-07 – Report on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures.

D. ACI440R-96 – State-of-the-Art Report on Fiber Reinforced Plastic (FRP) Reinforcement for Concrete Structures.

E. ACI503R – Pull-off test to determine FRP adhesion to concrete substrate.

F. 546R – Concrete Repair Guide

G. ASTM D3039 – Test Method for Tensile Properties of Fiber Resin Composites

H. ASTM D3528 – Test Method for Strength Properties of Adhesives in Shear by Tension Loading of Single Lap Joint Laminated Assemblies.

I. ASTM D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Tester.

J. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.

K. ICRI Guideline No. 03742 – Guide for the Selection of Strengthening Systems for Concrete Structures.

L. ICRI Guideline No. 03739 - Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials.

M. ICC AC 178 – Acceptance Criteria for Concrete and Reinforced and Unreinforced Concrete and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) Composite Systems.

N. Other specifications cited herein.

1.4 QUALITY CONTROL

A. A. Quality Control procedures performed by the Manufacturer shall include, but not be limited to the following:
   1. The Manufacturer shall have a nationally recognized program of contractor training, certification, and technical support.
   2. The Manufacturer shall have a minimum ten years experience in FRP Reinforcement confirmed by actual field tests of a minimum of 100 successful installations.
   3. The Manufacturer shall be able to supply testing data to demonstrate system properties and durability of the actual FRP Reinforcement to be used.

B. Quality Control procedures performed by the Contractor shall include, but not be limited to the following:
   1. The Contractor shall be trained by the Manufacturer and shall have completed a program of instruction in the use of FRP Reinforcement.
   2. The Contractor shall have a minimum of five years experience in FRP Reinforcement confirmed by actual field tests of at least 3 successful installations.
   3. The Contractor shall inspect all materials prior to application to assure that they meet specifications and have arrived to the job-site undamaged.
   4. The FRP Reinforcement shall be completely inspected by the Contractor during and immediately following application of the composite materials. Conformance with the design drawings, proper alignment of fibers and quality workmanship shall be assured. Entrapped air shall be released or rolled out before the epoxy sets. Defects shall be noted in the Daily Construction Log.

1.5 SUBMITTALS

A. Product Information:
   1. Manufacturer's product data sheets indicating physical, mechanical and chemical
      characteristics, environmental durability, technical specifications, and limitations of the materials used in the FRP system. Mechanical properties shall be reported as minimum acceptable or guaranteed values in accordance with Section 2.02.
   2. Manufacturer's installation instructions, maintenance instructions, and general recommendations regarding each material.
   3. Manufacturer's Material Safety Data Sheets (MSDS) for all materials to be used.

B. Engineering Calculations: Provide two copies of the engineering calculations detailing the design of the FRP reinforcement and stating any assumptions regarding the condition of the existing structure done by a professional engineer licensed in the State of New York.

C. Working Drawings: Working Drawings prepared and sealed by a professional engineer in the State of New York detailing the locations, dimensions, and orientations of all FRP materials to be installed.

D. Qualification Statement: Submit for record, a qualification statement by the Contractor listing their completed FRP Reinforcement projects, including size, location, owner engineer/architect, and contact numbers.

E. Submit for record, copies of purchase order and packaging slips showing quantities and dates of primer and resin purchased.

F. Submit for review and approval, shop drawings including the following:
   1. Limits of FRP Reinforcing.
   2. Details of epoxy injection crack repair and epoxy resin patching.
   3. Complete system details including, but not limited to, FRP Reinforcement, primer, resin, and protective coating.

G. Submit for record test results of the Pull-off test to determine FRP adhesion to concrete substrate and Witness Panel Testing Program per the procedure described in Sections 3.02 and 3.03.

H. Submit for record Daily Construction Logs kept by the Contractor. These logs shall include the following information:
   1. Weather and temperature at application times.
   2. Amount of product used and square footage/linear footage of substrate covered.
   3. Batch numbers of all products used.
   4. Names of all crew members.
   5. Any bond-strength tests, noting location, quantity, and who performed these tests noting location, quantity, and who performed these tests.

I. Submit and approved ICC Evaluation Report in the name of the proposed FRP system to be used on this project.

J. Submit independent test report verifying the environmental durability of the proposed system to be used on this project. Such reports shall include as a minimum:
   1. 10,000 hr. resistance to salt water.
   2. 10,000 hr. resistance to high temperature (93ºF) and high humidity (100%).
   3. 10,000 hr. resistance to alkali solution (pH 9.5).
   4. 3,000 hr. resistance to dry heat (128ºF).
   5. Resistance to 20 freeze/thaw cycles.
   6. Resistance to UV/condensation @ 100 cycles.

1.6 DELIVERY AND STORAGE

A. The products shall be delivered and stored in original, unopened containers. Containers must be clearly marked with legible and intact labels listing the manufacturer's name, brand name, product identification, and batch number.

B. FRP Reinforcement shall be stored in a cool, dry area away from direct sunlight, flame, moisture, chemical exposure, and other hazards. Cut fabric on clean surfaces.

C. Store primer, saturant, and protective coating under conditions as recommended by the Manufacturer in a cool, dry place out of direct sunlight. The ambient temperature in the storage area shall be between 45ºF and 85ºF. Epoxy resins shall be stored separately from hardeners. Products that have exceeded their shelf life shall not be used. After the resin has been mixed with the hardener, the mixed epoxy batch must be used within its pot life.

D. The Contractor is required to confirm that all materials used in accordance with this Section conform to local, state, and federal environmental and worker's safety laws and regulations.

E. FRP Reinforcement must not be handled roughly. Fiber, once removed from the original roll, must be stored either in rolls with a radius greater than 8in or by dry stacking flat.

F. The Contractor shall maintain all barricades during construction operations.

G. The Contractor shall properly shall properly dispose of empty containers in accordance with local regulations.

1.7 JOB-SITE CONDITIONS

A. Do not apply FRP Reinforcement materials if raining, snowing, or dew condensation is expected or existing concrete surface is wet or if the ambient or surface temperature are below 40ºF.

B. The ambient temperature and temperature of the epoxy components shall be between 50ºF and 80ºF at the time of mixing. See appropriate Manufacturer's technical data sheets for more specific instructions.

C. Precautions shall be taken to avoid damage to any surface near the work zone to mixing and handling of the specified material.

D. The Contractor is solely responsible for fume control and shall take necessary precautions against injury to Installer personnel or adjacent building occupants during application of primer and resin, etc. Contractor personnel shall use personal protective equipment (PPE) and the area shall be well vented to the outside. As a minimum, Installer must take the following precautions:
   1. The Contractor shall locate and protect building air intake during application.
   2. The contractor shall follow all local, state, and federal safety regulations.

3. The Contractor shall follow all Manufacturers' safety requirements as indicated on appropriate MSDS Sheets.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Subject to compliance with requirements, available manufacturers of FRP Fabric include, but are not limited to, the following:
   1. Fyfe Co. LLC: Tyfo SCH-41 Fabric
   2. QuakeWrap, Inc.: TU27C Carbon Fabric
   3. Sika Corp.: Sika Carbodur

B. Subject to compliance with requirements, available manufacturers of FRP Epoxy include, but are not limited to, the following:
   1. Fyfe Co. LLC: Tyfo S Epoxy
   2. QuakeWrap, Inc.: QuakeBond J201TC
   3. Sika Corp.: Sikadur 30

C. Subject to compliance with requirements, available manufacturers of FRP Saturant include, but are not limited to, the following:
   1. Fyfe Co. LLC: Tyfo Saturator
   2. QuakeWrap, Inc.: QuakeBond J300SR
   3. Sika Corp.: Sikadur 300

2.2 MATERTIALS

A. FRP Composite System
   1. A single manufacturer/supplier shall supply all constituent materials of the FRP Composite system including the fiber reinforcement, all polymers, and protective topcoats, where specified. FRP composite systems consisting of Fiber Reinforcement and polymers provided by more than one manufacturer/supplier are not allowed. System shall be an ICC-ES Approved System.
   2. The FRP composite system manufacturer/supplier shall supply the tensile properties of the composite material as determined by testing in accordance with ASTM D3039. The tensile properties of the composite system shall be based on a minimum of 25 tests and meet or exceed those tabulated below:

Typical Dry Fiber Properties	
Tensile Strength	580,000 psi
Tensile Modulus	33.4×10^6 psi
Ultimate Elongation	1.70%
Density	0.063 lbs/in.^{3}
Minimum weight per sq. yd.	19 oz.

Composite Gross Laminate Properties			
Property	ASTM Method	Typical Test Value	Design Value
Ultimate Tensile Strength in Primary Fiber Direction	D3039	143,000 psi (5.7 k/in. width)	121,000 psi (4.8k/in. width)
Elongation at Break	D3039	1.00%	0.85%
Tensile Modulus	D3039	33.4×10^6 psi	11.9×10^6 psi
Flexural Strength	D790	17,900 psi	15,200 psi
Flexural Modulus	D790	452,000 psi	384,200 psi
Longitundinal Compressive Strength	D3410	50,000 psi	42,500 psi
Longitundinal Compressive Modulus	D3410	11.2×10^6 psi	9.5×10^6 psi
Longitundinal Coefficient of Thermal Expansion	D696	3.6 ppm./°F	
Transverse Coefficient of Thermal Expansion	D696	20.3 ppm./°F	
Nominal Laminate Thickness	-	0.04 in.	0.04 in.

Epoxy Material Properties		
Property	ASTM Method	Typical Test Value
Tensile Strength	D638 Type 1	10,500 psi
Tensile Modulus	D638 Type 1	461,000 psi
Elongation Percent	D638 Type 1	5.00%
Flexural Strength	D790	17,900 psi
Flexural Modulus	D790	452,000 psi

3. The FRP Composite System shall have a Class 1 Fire classification as tested in accordance with ASTM E84.
4. The FRP System shall be VOC compliant for contact with potable water in accordance with EPA Method 8260.
5. The FRP System shall have successfully completed 10,000 HR Environmental Durability Testing in accordance with ICC-ES AC125.
6. The FRP System supplier shall provide, on request, independent results of large-scale structural evaluation of the FRP System on representative test specimens in accordance with ICC-ES AC125.
7. The FRP System supplier shall provide a list of failures containing date, name and location of project, contact name and phone number, type of failure and mitigation or repair if any, or a statement of no known failures.

B. Fiber Reinforcement

1. Carbon Fiber Reinforcement shall be delivered as a dry, unidirectional fabric with a fiber area weight of 19 oz/sq. yd.

C. Polymer Resins
1. Polymer resins should be selected based on the ambient temperature of the site at the time of installation.
2. The following polymer components must be provided as part of the FRP Composite System:
   a. An epoxy primer with a mixed viscosity of 650 ± 50 cps at 68°F.
   b. An epoxy filler, to be used for filling surface voids, with a mixed viscosity of 14,000 cps.
3. Do not dilute any resin, primer, or adhesive with any solvent.
4. Components which have exceeded the shelf life shall not be used.
5. Any epoxy which has exceeded its batch life shall not be used.

D. Protective Coatings
1. Urethanes or Epoxies.
2. Latex
3. Protective coatings other than those provided by the material manufacturer/supplier may be used provided such coatings have been approved by the material manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing conditions to assess the quality of the concrete substrate, identify potential obstructions and verify dimensions/geometry shown on shop drawings.

B. Report, in writing to the Engineer, as required in the General Conditions and deficiencies in the surface that render it unsuitable for proper execution of this work.

3.2 PREPARATION

A. Environmental Conditions
1. Do not install FRP when the ambient temperature is below 40°F and above 100°F. In cold conditions, auxiliary heat may be applied to raise the ambient temperature to a suitable level. Utilize clean heat sources for this purpose (electric, propane, etc.) that do not contaminate the substrate.
2. The presence of moisture inhibits the adhesion of the epoxies to the substrate. Do not install FRP when surface moisture is present on the substrate or when rainfall or condensation is anticipated in the work areas.
3. Concrete surfaces shall be dry and free of moisture and frost, and tested by the Contractor to evaluate moisture transmission in accordance with ASTM D4263 “Indicating Moisture in Concrete by the Plastic Sheet Method.”
4. If water leakage exists through cracks or concrete joints, water flow must be stopped prior to FRP installation.

B. All concrete surfaces shall be sound. Remove deteriorated concrete, dust, laitance, grease, paint, curing compounds, waxes, impregnations, foreign particles, and other bond inhibiting materials from the surface by blast cleaning or equivalent mechanical means.

C. All concrete surfaces shall be air blasted and vacuumed clean to a dust free condition.

D. Concrete surface irregularities less than one inch shall be ground and smoothed and/or filled with an approved repair mortar with the addition of one-part oven dried sand to make an epoxy mortar. Surface irregularities shall be limited to less than 0.04 inches. Surface irregularities greater than one inch shall be repaired using an approved cementitious repair mortar.

E. If corrosion of the existing steel reinforcement exists, the steel and concrete must be repaired before installation of the FRP. Any deteriorated concrete or corroding reinforcing steel must be repaired per ICRI Guideline #03730. Do not cover corroding reinforcing steel with FRP.

F. Cracks in the concrete substrate greater than 0.010 in wide must be injected with epoxy or similar material approved by the Engineer of Record.

G. External concrete corners shall be ground to at least a 1/2" radius when perpendicular to fiber orientation and internal corners shall be smoothed by toweling epoxy mortar into the corners.

H. The adhesive strength of the concrete shall be verified after preparation by random pull-off testing (ACI 503R) at the direction of the Engineer. Minimum tensile strength is 200 psi with concrete substrate failure, or as approved by the Engineer.

I. Maintain control of concrete chips, dust, and debris in each area of work. Clean up and remove such material at the completion of each day of blasting.

J. All adjacent areas not receiving FRP shall be protected with plastic sheeting.

3.3 INSTALLATION

A. Mixing of Primer and Saturant
   1. Mix components in accordance with Manufacturer's recommendations.
   2. Diluting is not permitted. Pre-condition materials as indicated on technical data sheet.
   3. Mix only that quantity which can be used within its pot life.
   4. Do not batch delivered units into smaller quantities. Mix only full units.

B. Primer Applications
   1. All surfaces must be clean, dry, and free of dust and debris.
   2. Primer may be applied with a brush or roller. Apply second coat as necessary after first coat has penetrated into the concrete.
   3. Using a brush, stipple primer into any voids, bug holes, etc.
   4. Primer must be covered with fiber within 24 hours of application, depending on

5. temperature conditions. If 24-hour window is exceeded, the primed surfaces must be solvent wiped with a fast flashing solvent or roughened with sandpaper to break the amine blush.

C. Application of Filler/Adhesive Paste
1. Prepare epoxy filler/paste in accordance with Manufacturer's instructions. Mix only the quantity of filler that can be used in its batch life. Batch life will be reduced in higher temperatures and when mixed in higher volumes. Adjust batch size accordingly. Do not use any epoxy that has exceeded its batch life
2. To avoid allowing filler to cure prior to FRP application, apply primer only to surfaces that will be laminated within 1 hour.
3. Constituent parts must be accurately metered and thoroughly mixed for between 2 and 3 minutes. For large batches (over 1 gallon) use a mechanical mixer.
4. Apply filler to surface voids using a steel or stiff plastic spreader. Ensure all voids and offsets are thoroughly filled and excess filler is removed.

D. Application of FRP Reinforcement
1. All surfaces must be primed and, where needed, filled. Primer and filler, which has cured for over 24 hours, must be abraded with a light sand sweep, sandpaper, or abrasive pad, unless still tacky to the touch.
2. Saturate the fabric.
3. Apply using approved hand methods.
4. Prior to the application of the fabric, all uneven surfaces shall be thickened using epoxy grout.
5. Saturate and apply sub sequent layers of the fabric according to the Manufacturer's recommendations.
6. Use a roller or hand pressure to ensure proper orientation of members and release or roll out entrapped air and ensure that each individual layer is firmly bedded and adhered to the preceding layer or substrate.
7. Repeat preceding steps as necessary to obtain required thickness.
8. Apply a final coat of thickened epoxy grout and detail all fabric edges, including butt splices, termination points, and jacket edges.

E. Application of Protective Coatings
1. Protective intumescent fire protection coating shall be applied as a final, outermost layer to the externally bonded FRP Reinforcement.
2. Protective coating shall not be applied before the final resin coat has become tack free.
3. The surface to which the protective coatings are to be applied must be cleaned of any dust or debris using a dry cloth or brush. The surface must also be free of any moisture, oils, or other substances that would prohibit bond of the coating.

F. Field Quality Control
1. Supervision:
   a. A Field Supervisor trained by the Manufacturer, shall observe all aspects of onsite preparation and material application, including surface preparation, resin component mixing, application of primer, application of resin and fiber sheet, curing of composite, and the application of protective coatings.

b. Newly installed FRP Composite materials shall be visually inspected to insure complete saturation, full contact between layers and to substrate, proper fiber orientation, and lack of wrinkles, bubbles, and voids.

2. Inspection of Voids/Delaminations:
   a. After allowing at least 24 hours for initial resin cure to occur, perform a visual and acoustic tap test inspection of the layered surface.
   b. Large delaminations shall be marked for repair. Small delaminations less than 2 in^2 in size and which are not localized do not require corrective action.
   c. Large delaminations should be repaired by either injection with resin or by removing delaminated area and patching with new fabric, allowing a 6 inch overlap all around the repair. This is at the discretion of the inspector.
3. Bond Testing
   a. Direct Tension Pull-Off Tests may be conducted to evaluate the bond of the FRP System.
      1) Test Conditions:
         a) The FRP System shall be allowed to cure for a minimum of 48 hours before execution of the Direct Tension Pull-Off Test.
         b) The locations of the Pull-Off Test shall be representative and on flat surfaces. If possible, Pull-Off Tests shall be conducted on areas of the FRP System subjected to relatively low stress during service life.
      2) Test Frequency
         a) Perform a minimum of one Pull-Off Test per 500 ft^2 of installed FRP Reinforcement.
         b) Pull-Off Tests must be performed on each area of fiber sheet installed on a single day.
         c) Pull-Off Tests must be performed on each type of concrete substrate or for each surface preparation technique used if variations in such conditions exist.
   b. Test Procedure
      1) The FRP surface to which the adhesion fixture is to be mounted shall be sanded smooth with medium grit sandpaper, rinsed with water, and allowed to dry.
      2) Attach the adhesion fixture with the designated bonding agent. Leave to cure in accordance with Bonding Agent Manufacturer's instructions.
      3) Core drill or square cut around the perimeter of the adhesion fixture through the FRP laminate and into the substrate concrete using carbide tipped or diamond core bit or butting wheel. Cut to a depth of 1/4" to 1/2" into the concrete.
      4) Position the detaching assembly over the adhesion fixture and attach the adhesion fixture to the detaching assembly. Align perpendicularly. Adjust the detaching assembly legs as required.
      5) Take up the slack in the adhesion tester by screwing down the adjustment knob.
      6) Set the force indicator to the zero mark.
      7) Apply a manual or mechanized loading force to provide a constant cross head speed until the adhesion fixture detaches from the concrete element.

8) The loading rate shall be such that the fixture detaches in less than 100 seconds.
9) The failure mode must be cohesive failure within the concrete.
10) The tensile bond strength must be in excess of 200 psi or as specified within project drawing or specifications.
11) Repair the tested areas in accordance with this specification.
12) Witness Panel Testing:
    a) Witness Panels shall be fabricated onsite using the same methods used to apply the FRP System to evaluate the tensile properties of the materials. Witness Panels shall be prepared on a smooth surface such as a sheet of glass. Witness Panels may be tested or retained for future testing.
    b) Panels shall be fabricated as a minimum 12"x12" laminate of two stacked layers of identical fiber orientation.
    c) The witness panels shall be allowed to cure onsite for a minimum of 82 hours before delivery to the testing agency.
    d) Frequency: Two witness panels shall be fabricated near the start of each workday.
    e) Report: The contractor shall submit a Quality Control in accordance with Section 1.04 of this specification and also include the details of field locations of materials used for fabrication of Witness Panels.

c. Repair of Damaged or Defective Areas
1) Repair of all the defective work after the minimum cure time for the FRP laminates shall comply with material and procedural requirements defined in this specification, or as provided by the Manufacturer according to the type of defect, the type of application, and the materials used.
2) Repair all defects in a manner that will restore the system to the designed level of quality. Removal of effective sections shall be replaced and properly spliced with non-damaged areas. Splice locations shall be prepared for bond by abrading cured surfaces. Voids shall be prevented.
3) The Owner's Representative shall approve repair procedures for conditions that are not specifically address in this specification. All repairs and touch-up shall be made to the satisfaction of the Owner's Representative and the Engineer of Record.

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CAST-IN-PLACE CONCRETE
SECTION 033000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.
5. Building frame members.
6. Corner and gate posts as indicated on site drawing C011

B. Related Sections:

1. Division 03 Section "Architectural Concrete" for general building applications of specially finished formed concrete.
2. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
3. Division 32 Section "Concrete Paving" for concrete pavement and walks.
4. Division 32 Section "Decorative Concrete Paving" for decorative concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and

preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. Product Data for Credit IEQ 4.3: For curing and sealing compounds, documentation including printed statement of VOC content.
3. Design Mixtures for Credit ID 1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Formwork Shop Drawings for suspended slabs and building frame members: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds for exterior slabs.
7. Bonding agents.
8. Adhesives.
9. Vapor retarders.
10. Joint-filler strips.

C. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel with a minimum of 5 years documented experience on projects of similar scope and complexity.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment, and with current NYSDOT certification.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

G. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete subcontractor.
    e. Special concrete finish subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1 or better.
    b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    c. Structural 1, B-B or better; mill oiled and edge sealed.
    d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt

irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I Type II Type I/II, gray. Supplement with the following:

    a. Fly Ash: ASTM C 618, Class F.
    b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 1N coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: See various mix designs.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94/C 94M.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

C. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ChemMasters.
    b. Davis Colors.
    c. Lambert Corporation.
    d. Scofield, L. M. Company.

2. Color: As selected by Architect from manufacturer's full range.

2.6 WATERSTOPS

A. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Adeka Ultra Seal/OCM, Inc.; Adeka Ultra Seal.
    b. Greenstreak; Hydrotite.

c. Vinylex Corp.; Swellseal.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fortifiber Building Systems Group; Moistop Ultra 15.
b. Raven Industries Inc.; Vapor Block 15.
c. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.8 CURING MATERIALS

A. Wet Curing Cover: A rolled sheet product consisting of an impermeable layer over an absorptive layer to hold moisture against the slab.

1. Products:

a. Ultracure.
b. Hydracure.
c. Conkure.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
b. Kaufman Products, Inc.; Thinfilm 420.
c. L&M Construction Chemicals, Inc.; L&M Cure R.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 20 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in all concrete mix designs.

2. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Maximum Slump Limit: 4 inches with addition of a water reducer; 6 inches with addition of a low dose of high-range water-reducing admixture; 8 inches for concrete with a full dose of high-range water-reducing admixture.
4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery.
5. Nominal maximum aggregate size: 1-1/2-inches.

B. Interior Slabs-on-Grade, Suspended Slabs, and Building Frame Members: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Maximum Slump Limit: 4 inches with addition of a water reducer; 6 inches with addition of a low dose of high-range water-reducing admixture; 8 inches for concrete with a full dose of high-range water-reducing admixture.
4. Air Content: 3 percent maximum at point of delivery. Do not use an air entrainment admixture.
5. Nominal maximum aggregate size: 1-inch.

C. Exterior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4,500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Maximum Slump Limit: 4 inches with addition of a water reducer; 6 inches with addition of a low dose of high-range water-reducing admixture; 8 inches for concrete with a full dose of high-range water-reducing admixture.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery.
5. Nominal maximum aggregate size: 1-inch.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete unless noted otherwise.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength. Produce additional test cylinders for early testing.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape and/or sealants.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement prior to placement of concrete. “Wet sticking” of reinforcement is not allowed. All reinforcement must in secured in place and inspected prior to ordering concrete delivery. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Use of concrete brick supports is not allowed. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with early entry power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Complete saw cut joints no later than 8 hours after completion of slab finishing operations.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable. Provide two strips of waterstop at all joints unless noted otherwise.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect. Water may only be added with the approval of the Architect and only if the amount of mix water held back at the batch plant is clearly noted on the computer generated batch plant ticket for each truck.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view and to surfaces to receive a rubbed finish.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until

surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist

cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Cure Interior Slabs by Moisture Curing Only: Do not use curing compounds on interior slabs. Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Wet curing cover (per 2.8, A, 1), water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing (alternative method for exterior slabs only): Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound (alternative method for exterior slabs only): Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried.

Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, and for each truck delivery thereafter. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure two sets of two and one set of three 4 inch x 8 inch cylinder specimens for each composite sample.
   b. Cast and field cure two sets of two standard cylinder specimens for each composite sample. Omit field cured samples if structure can be kept above 50 deg F in a moist condition for 7 days after pour.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of three specimens at 28 days. Hold the final set of two specimens for subsequent breaks as directed by the engineer of record should the 28-day breaks fall below an acceptable compressive strength.
   a. A compressive-strength test shall be the average compressive strength from a set of specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

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SECTION 035416
CONCRETE FLOOR UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
1. Concrete flashpatching.
2. Concrete underlayment.
3. Moisture Control System.

1.2 QUALITY ASSURANCE

A. Installer: Firm with not less than three (3) years of successful experience in the installation of the specified concrete floor topping. The installer shall be trained in proven application and finishing procedures assuring the manufacturer's quality standards.

1.3 SUBMITTALS

A. Product Data: Submit technical product data, installation instructions and recommendations from the specified concrete floor topping manufacturer.

B. LEED Submittal:
1. Product Data for Credit MR 2: Building Product Disclosure and Optimization - Provide Type III Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113. Excludes products fabricated from rigid PVC or CPVC plastic.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Documentation for Credit MR 4: Construction and Demolition Waste Management: Include a statement indicating percentage of materials diverted from disposal in landfills and incinerators, and where recyclable resources are directed back to the manufacturing process.

1.4 JOB CONDITIONS

A. Provide sufficient ventilation and maintain building temperature at 50°F minimum before, during and after installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Flashpatching: SD-F Feather Finish by Ardex Engineered Cements or accepted equal.
   1. Type: Portland Cement based, self-drying, trowelable from featheredge to 1/2".
   2. Compressive Strength: 4200 psi after 28 days when tested per ASTM C109.
   3. Primer: Product as recommended by manufacturer for substrate, conditions and application.
   4. Water: Clean and potable.

B. Concrete Underlayment: LU-100 Self Leveling Underlayment Concrete by Ardex Engineered Cements or accepted equal.
   1. Type: Portland Cement based, self leveling underlayment from 1/8" to 1-1/2" without aggregate and up to 5" with aggregate.
   2. Compressive Strength: 4100 psi after 28 days when tested per ASTM C109.
   3. Primer: Product as recommended by manufacturer for substrate, conditions and application.
   4. Aggregate: Well graded washed pea gravel 1/8" to ¼" for use when installed over 1-1/2" thickness.
   5. Water: Clean and potable.

C. Moisture Control System: Moisture Control System MC RAPID by Ardex or accepted equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the work is to be placed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Remove all loose and deteriorated existing concrete underlayment and other surface finishes from existing floor in area to be repaired.

B. Remove all mud, oil, grease adhesives, and other contaminants from existing concrete floor in conformance with underlayment manufacturer's written and verbal recommendations.

C. Broom clean and final vacuum all contaminants from floor immediately prior to installation.

D. Joint Preparation: Honor all expansion and isolation joints.

E. Apply moisture control system to all slab on grade concrete floors prior to application of concrete floor underlayment. Apply in compliance with manufacturer's directions.

3.3 INSTALLATION OF CONCRETE FLASHPATCHING

A. Apply primer as required by manufacturer's specifications.

B. Install concrete flashpatching in conformance with manufacturer's recommendations to provide a smooth finish to conceal any existing surface imperfections and level minor depressions.

C. Finish to blend with existing adjacent floor elevation and to produce a smooth surface suitable for flooring installation without the telegraphing of substrate imperfections.

D. Install to a tolerance of 1/8+ when measured with ten foot straight edge.

E. Confirm all elevation transitions with the Architect.

3.4 INSTALLATION OF CEMENTITIOUS UNDERLAYMENT

A. Apply primer as required by manufacturer's specifications.

B. Install cementitious underlayment in conformance with manufacturer's recommendations at minimum thickness of 1/8" over the highest point of the floor.

C. Place underlayment finish to a tolerance of 1/8± when measured with ten foot straight edge to produce a smooth and level surface suitable for flooring installation.

3.5 PROTECTION

A. Prior to the installation of the finish flooring, the surface of flashpatching and underlayment should be protected from abuse by other trades by the use of plywood, Masonite, or other suitable protection course.

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SECTION 040120
MASONRY RESTORATION CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Cleaning of exterior brickwork.
   2. Sealing of exterior masonry.

1.2 QUALITY ASSURANCE

A. Experience and Skill: Work must be performed by a firm having a minimum of 5 years successful experience in comparable masonry restoration projects and employ personnel skilled in the restoration processes and operations indicated.

B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

C. Source Limitations: Obtain each type of material for masonry cleaning from one source with resources to provide materials of consistent quality in appearance and physical properties.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each product indicated, including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

B. Job Sample
   1. Prior to cleaning main area, clean a 4' x 4' sample area of each masonry type to receive cleaning for approval by the Architect.
   2. A representative of the cleaning materials manufacturer will be present during the preparation and application of all test areas.
   3. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional stain removal, general cleaning and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.
   4. Reclean and adjust cleaning method if directed by the Architect.
   5. Obtain Architect's acceptance of visual qualities before proceeding with the work. Retain acceptable panels in undisturbed condition, suitably marked and protected during cleaning as a standard for judging completed work.

C. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.
   1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Cleaning Program a written description of such

materials and methods, including evidence of successful use on comparable project, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

1.4 JOB CONDITIONS

A. Clean masonry surfaces only when air temperatures are at least 40°F and will remain so until masonry has dried out (at least 7 days after completion of cleaning).

B. Delivery of Materials: Materials shall be delivered to the site in unopened, unbroken original containers bearing the manufacturer's label. The label shall specify the quality, brand, trade name, batch number, directions for use and manufacturer's name, all of which shall be plainly legible at time of use.

C. Storage of Materials: Sufficient cleaning materials to complete the entire project shall be purchased by the Contractor and stored in factory sealed containers at the job site.

D. Coordinate masonry cleaning with public circulation patterns at Project site. Some work is near public circulation patterns**.** Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.
   1. Do not commence cleaning until all demolition work is complete.

E. Cleaning Scope of Work: The following is the masonry cleaning scope of work:
   1. Clean efflorescence from the existing generator enclosure building, and the north façade where indicated on drawing A200.
   2. Wash the entire building facade with the material listed in section 2.2.B. and a low pressure wash and rinse.

PART 2 - PRODUCTS

2.1 GENERAL

A. Selection of the specific cleaner(s) and techniques used is dependent on the type of substrate and its condition, the nature of the existing staining and the results of the tests conducted at the job site.

2.2 CLEANING MATERIALS

A. Masonry Restoration Cleaner at areas to remove efflorescence: Enviro Klean Safety Klean by ProSoCo or accepted equal by Dumond Chemicals or Diedrich Technologies.

B. General Building Wash: Enviro Klean restoration cleaner by ProSoCo or accepted equal by Dumond Chemicals or Diedrich Technologies.

C. Copper Stain Remover: Remove copper stains from grade up 4'-0" at perimeter of building.
   1. Product: Sure Klean 800 Stain Remover by ProSoCo or accepted equal.

D. Masonry Sealer: Siloxane PD by ProSoCo or accepted equal by Dumond Chemicals or Diedrich Technologies.

PART 3 - EXECUTION

3.1 PREPARATION

A. Replacement of masonry units at new structure locations shall have been completed prior to the beginning of the cleaning operation. Do not start cleaning until manufacturer's set time has elapsed for any masonry products.

B. Comply with recommendations of manufacturers of chemical cleaners for protecting applicators and adjacent building surfaces against damage from exposure to their products. Keep wall wet below area being cleared to prevent streaking.

C. Supply, install and maintain adequate canvas or reinforced polyethylene baffles to protect persons, autos and adjacent properties from over-spray and wash of cleaning chemicals.

3.2 CLEANING

A. Remove surface efflorescence prior to wet cleaning with dry stiff bristle brush. Wire brushing will not be accepted.

B. Comply with manufacturer's recommendations regarding application and neutralization of all chemical cleaners.

C. Clean masonry with the weakest possible solution which will give satisfactory results.

D. Repeat applications of cleaners until unacceptable stains or paint coatings are removed.

E. Dispose of run-off from cleaning operations by legal means and in manner which prevents damage and penetration of fluids into adjacent building materials and surfaces.

3.3 SEALING

A. Upon completion and after final cleaning of masonry work, apply two coats of sealer to exterior exposed face of brick. Apply in accordance with manufacturer's recommendations by spray application.

3.4 CLEANUP

A. Contractor shall be responsible for removal and disposal of necessary masking materials following completion of cleaning operation. Windows and non-masonry areas shall be left clean and undamaged.

B. All residual washed from buildings shall be swept or flushed away from surrounding sidewalk and service areas nightly. All premises shall be clean and neat at all times.

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SECTION 040122
MASONRY RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Removal and replacement of existing brick masonry for new structural steel installation.

1.2 QUALITY ASSURANCE

A. Standards - Comply with the latest edition of the following:
   1. Brick Institute of America, "Technical Notes on Brick Construction".
   2. U.S. Department of the Interior, "Preservation Brief 2 - Repointing Mortar Joints in Historic Brick Buildings".

B. Experience and Skill: At least 5 years successful experience in comparable masonry repair projects and current personnel skilled in the materials, procedures and operations indicated.

C. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

1.3 SUBMITTALS

A. Samples - Submit samples of each new exposed masonry material to be used for replacing existing materials. Include the full range of colors and textures to be expected in completed work.
   1. Mortar: Sample strips set in plastic channel.

B. Product Data: Submit manufacturer's technical data for each product.

1.4 JOB CONDITIONS

A. Packaged Products:
   1. Deliver materials to the site in manufacturer’s original, sealed containers. Do not deliver materials, which have exceeded shelf life limitation set forth by the manufacturer.
   2. Comply with manufacturer’s printed instructions for storing and protecting materials.

B. Protect masonry materials from wetting by rain, snow or ground water and from staining or inter-mixture with earth or other types of materials.

C. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers.

D. Do not repoint mortar joints or repair masonry unless air temperatures are between 40°F and 80°F and will remain so for at least 48 hours after completion of work. Provide temporary enclosures and heat if ambient temperatures are below requirements.

E. Prevent mortar used in repointing and repair work from staining face of surrounding masonry and other surfaces. Remove immediately mortar in contact with exposed masonry and other surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mortar Materials
   1. Portland Cement: ASTM C150, Type I, White.
   2. Hydrated Lime: Type S, ASTM C207.
   3. Aggregate for Mortar: ASTM C144, with sand selected to produce existing mortar color and to match size and gradation of existing mortar.
   4. Water: Clean, free of oils, acids, alkalis and organic matter.
   5. Colored Pigment: A & H Series Concentrated Colors by Solomon Grind Chem Service or accepted equal.

B. Mortar for Brick: 1 part Portland cement, 1 parts lime and 6 parts aggregate. Coloring to match approved job sample panel.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 MASONRY REMOVAL

A. Remove carefully by hand any masonry units scheduled for removal.

B. Support and protect masonry to remain in area surrounding removal area.

C. Salvage as many whole, undamaged masonry units as possible. Remove mortar, loose particles and soil from salvaged units; store units for reuse.

D. Protect adjacent surfaces not being restored including sills, ledges, and projections from material droppings.

E. Clean edges of remaining masonry around removal areas and remove any unused anchors or imbed inserts.

3.3 MASONRY REBUILDING

A. Fit new or salvaged masonry units into bonding and coursing pattern of existing area around removed masonry; for any cutting, use motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

B. Maintain temporary shoring during rebuilding. Remove shoring as areas are filled in.

C. Fill bed, head and collar joints completely; match existing joint widths and profile.

D. Tool exposed joints in repaired areas to match surrounding joints.

3.4 CLEANING

A. Clean exposed masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

B. Accomplish final cleaning by spraying clean water at low pressure (100 psi or less) and use stiff nylon or bristly brushes to remove excess mortar and foreign matter from exposed masonry surfaces.

C. For final cleaning of mortar and foreign matter not removed by previous water cleaning methods, obtain Architect's permission to proceed with chemical cleaning. Comply with manufacturer's recommendations regarding application and neutralization of all chemical cleaners. Clean masonry with the weakest possible solution which will give satisfactory results. Repeat applications of cleaners shall be made until surfaces are free of unacceptable stains.

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SECTION 042000
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Concrete masonry units.
   2. Masonry accessories.

1.2 QUALITY ASSURANCE

A. Standards - Comply with the latest edition of the following:
   1. Specifications for Masonry Structures, ACI 530.1/ASCE 6-95, except if more restrictive requirements are indicated within this Section.
   2. National Concrete Masonry Association (NCMA) "Specification for the Design and Construction of Load-Bearing Concrete Masonry".
   3. "NCMA-TEK" Series.

B. Workmen and Supervisor: Use adequate numbers of skilled journeyman masons during execution of this work. Provide full-time inspection to ensure conformance with specifications.

C. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required.

D. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

E. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1.3 SUBMITTALS

A. Manufacturer's Product Data:
   1. Certifications that masonry units meet or exceed Specifications.
   2. Certifications that mortar materials meet or exceed Specifications.

B. Mix Designs
   1. Mortar.
   2. Grout.

C. Shop Drawings
   1. Precast concrete trim, showing sizes, profiles, locations, and anchorages of each masonry unit required.

2. Reinforcing bar in walls, bar schedules, diagrams of bent bars, and arrangement of masonry reinforcement. Show elevations of reinforcement in wall at 1/4"=1'-0" scale.

D. Field Constructed Mock-ups: Prior to installation of masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, using sample submittals of masonry units and mortar. Represent completed masonry work for qualities of appearance, materials and construction. Comply with the following requirements:
   1. Locate mock-ups on site as directed by Architect.
   2. Build one mock-up for the following types of masonry in sizes of approximately 4' long by 4' high.
      a. Typical interior concrete masonry unit wall.
      b. Typical exterior architectural concrete masonry unit wall.

E. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   3. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 SPECIAL INSPECTIONS

A. The Owner will engage the services of a Special Inspector for this project. The Special Inspector will provide or coordinate inspection and testing requirements as necessary in accordance with the provisions of Chapter 17 of the Building Code of New York State.

B. In accordance with the Statement of Special Inspections, the Special Inspector shall provide or coordinate inspections and verifications as noted on drawings.

C. The Special Inspector shall submit copies of reports to Architect, Engineer, Owner's Site Representative and Contractor on day that tests are made. Include date of testing, weather conditions, building location and test location.

1.5 JOB CONDITIONS

A. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion and other causes. If units become wet, do not place until units are in an air-dried condition.

B. Store cementitious materials off the ground, under cover and in dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories to prevent corrosion and accumulation of dirt.

E. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

F. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Masonry Units: Normal weight hollow load-bearing units, ASTM C90, Type I, Grade N, with average net compressive strength of 2,800 psi for individual units. Nominal face dimensions of 16" long x 8" high x width as indicated including corners, bond beams units, and other special shapes. Manufacturer's standard color and texture. Provide fire resistance rating as noted on drawings.
   1. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
   2. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
   3. Rated Concrete Masonry Units: Provide D-2, two hour rated CMU in compliance with TEK 7-1C of the Concrete Masonry Association.

B. Architectural Concrete Masonry Units (Exterior Dumpster Enclosure): Groundface Dryblock system as manufactured by Westbrook Concrete Block Company, Inc., or approved equal.
   1. Size: 7 5/8”x15 5/8” with corner units.
   2. Color: As selected by architect from full range of standard colors.
   3. Wall Cap: Bond Beam, 7 5/8”x 15 5/8”.

C. Mortar: Comply with ASTM C270, Type S, Proportion Specification consisting of the following.
   1. Portland Cement: ASTM C150, Type I, light gray. Provide white at ACMU Type "A".
   2. Hydrated Lime: ASTM C207, Type S.
   3. Aggregates: ASTM C144.
   4. Water: Clean and potable.

D. Grout: Comply with ASTM C476; fine grout, slump of 8 to 10 to enable complete filling all spaces intended to receive grout, fc = 2,500 psi.

E. Horizontal Joint Reinforcing for Composite Walls: Dur-O-Wall Truss Tri-rod or accepted equal. Welded wire units in minimum 10' straight lengths with matching corner ("L") units or special shapes for circular walls as required, steel (ASTM A82) 9 gage deformed continuous side rods and plain diagonal cross rods (truss-type), widths as required to embed side rods fully in mortar with at least 5/8" to exterior joint faces and 1/2" elsewhere. Hot-dip galvanize units after fabrication, ASTM A153, Class B-2 coating (1.5 ounces per square foot).

F. Masonry Ties: Hot dipped galvanized No. 103-C Triangular Ties by Heckmann Building Products or accepted equal. Provide length as required to provide 5/8" clearance to exposed face. Provide hot dipped galvanized finish. Provide corrosive resistant expansion or self drilling anchors.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
   1. Testing and inspections will comply with Level B Quality Assurance in accordance with TMS 402/ACI 530.
   2. Refer to section 014000 Quality and Code requirements for general testing responsibilities.

3.2 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.3 INSTALLATION

A. Use full uncut units wherever possible. Dry cut units with saw where required to provide bonding pattern shown and to fit adjoining work neatly, all with clean sharp, unchipped edges.

B. Use only dry concrete masonry units. Do not wet prior to installation.

C. Pattern Bond: Running bond.

D. Accurately space surface bond patterns with uniform joint widths and properly located openings, etc. Avoid using less than half size units at corners, jambs and wherever possible at other locations.

E. Build walls plumb and with courses level, accurately spaced and coordinated with other work.

F. Stopping and Resuming Work: Clean exposed surfaces of set masonry and remove any loose units and mortar prior to resuming.

G. Built-In Work: Progressively build-in items, surrounding them solidly with masonry. Grout CMU cores solid to footings under bearing plates, beams, lintels, posts and similar conditions unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells and cross-webs.

B. Maintain vertical continuity of cores or cavities to be reinforced or grouted; provide minimum clearance and group coverage for vertical reinforcement bars. Keep cavities free of mortar droppings.

C. Joints: Maintain 3/8" head and bed joint widths, except for minor variations required to maintain bond alignment.

D. Cut joints flush for walls to be concealed. Tool interior exposed joints slightly concave, using a jointer larger than joint thickness. Tool all exterior joints concavely and densely pack. Rake out mortar to prepare for caulking, sealants and reglets where shown.

E. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.5 REINFORCEMENT PLACEMENT

A. Horizontal Joint Reinforcement
   1. Fully embed entire length of longitudinal side rods with at least 1" of mortar to exterior side of walls and 5/8" elsewhere.
   2. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections at junctures. Cut and bend units as directed by manufacturer for continuity at special conditions.
   3. Space reinforcing at 16" on center vertically, unless otherwise recommended by manufacturer or shown on Drawings.
   4. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcing placed in two horizontal joints approximately 8" apart, both immediately above and below sills. Extend reinforcing a minimum of 2'-0" beyond jambs of the opening.
   5. Lap reinforcement a minimum of 6" at splices.

B. Reinforcement Bars
   1. Clean reinforcement of loose rust, mill scale, dirt or ice.
   2. Position reinforcement accurately at the spacing shown. Support and secure vertical bars against displacement. Reinforcing may be placed as the masonry work progresses. Provide a clear distance between any closely spaced vertical bars of not less than the nominal bar diameter or 1" (whichever is greater). Provide minimum lap indicated at all splices.

3. Lap vertical reinforcement 48-bar diameters at splices.
4. Lap horizontal reinforcement 30-bar diameters at splices. Where possible, stagger splices.
5. Reinforce bond beams with two #5 bars unless otherwise noted.
6. Provide minimum vertical reinforcing of one #4 bar in window and door jambs, at ends of walls, corners, and each side of vertical control joints. Locate bar a maximum of 16 inches from end of CMU. If typical vertical wall reinforcing noted is larger than #4, use the larger size.

C. Masonry Ties and Anchors: Install masonry ties securely to existing concrete or masonry walls. Provide ties not greater than 1'-4" on center vertically where new walls tie into existing walls.

3.6 LINTELS

A. Install loose lintels of steel and other materials where shown.

B. Provide minimum bearing of 8" at each jamb unless otherwise indicated.

3.7 GROUTING MASONRY WORK

A. Preparation of Cores and Spaces: Inspect and clean out dirt mortar droppings, loose pieces of masonry and other foreign materials. Clean reinforcement and adjust to proper position.

B. Place grout only after entire height of masonry to be grouted can resist displacement of units and breaking of mortar bond. Install bracing, if required, before grouting operations.

C. Grouting:
1. Comply with low-lift grouting method in NCMA TEK 23A, "Grouting for Concrete Masonry Walls".
2. Fill metal door jambs solid with grout. Vibrate grout while placing in maximum 4' high lifts. Limit any interruptions in pouring to less than 1 hour.
3. Use grout not mortar to fill masonry.

3.8 PROTECTION OF WORK

A. During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in process.

B. Extend cover a minimum of 24" down both sides and hold cover securely in place.

C. Do not apply uniform floor or roof loading for at least 72 hours after building masonry walls or columns.

D. Prevent grout, mortar or soil from staining the face of masonry to be left exposed or painted. Immediately remove grout or mortar in contact with such masonry. Protect base of walls from rain-splashed mud or mortar splatter by means of coverings spread on ground and over wall surface.

3.9 TOLERANCES

A. Maximum variation from plumb in vertical lines and horizontal and vertical surfaces of walls, 1/4" in 10 feet.

3.10 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged or improperly laid units. Match new units to adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: While tooling joints, fill voids or holes completely with mortar. Point-up all joints at corners and openings adjacent to work to provide neat, uniform appearance.

C. Clean exposed masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

D. Provide final wash down and cleaning of completed masonry work with masonry cleaning solution in accordance with manufacturer's recommendations.

3.3 CONCRETE MASONRY SEALER

A. Upon completion and after final cleaning of masonry work, apply two coats of concrete masonry sealer to exterior exposed face of architectural concrete masonry. Apply in accordance with manufacturer's recommendations by spray application.

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STRUCTURAL STEEL FRAMING
SECTION 051200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
3. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
4. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other metal items not defined as structural steel.
5. Division 05 Section "Metal Stairs."
6. Division 09 painting Sections for surface-preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use ASD; data are given at service-load level.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4.1 [and credit MR 4.2]: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5.1 [and credit MR 5.2]: Documentation indicating location and distance from Project of material manufacturer and point of extraction, harvest or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Laboratory Test Reports for Credit IEQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified installer and fabricator.

B. Welding certificates and welding procedure specifications (WPS)

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU.

B. Installer Qualifications: A qualified installer with a minimum of 5 years documented experience on projects of similar scope and complexity.

C. One shop location is assumed for the purposes of this contract. Where fabrication takes place in more than one shop, additional inspection costs resulting therefrom will be accomplished at the Contractor's expense.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:

1. W-Shapes: 60 percent.
2. Channels, Angles-Shapes: 60 percent.
3. Plate and Bar: 25 percent.
4. Cold-Formed Hollow Structural Sections: 25 percent.
5. Steel Pipe: 25 percent.
6. All Other Steel Materials: 25 percent.

B. W-Shapes: ASTM A 992/A 992M.

C. Channels, Angles-Shapes: ASTM A 36/A 36M.

D. Plate and Bar: ASTM A 36/A 36M.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: Standard.
2. Finish: Black except where indicated to be galvanized.

G. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.

C. Unheaded Anchor Rods: ASTM F 1554, Grade 36.

1. Configuration: Straight.
2. Nuts: ASTM A 563 hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

D. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Plain.

2.3 PRIMER

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer: Comply with Division 09 painting Sections.

C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, unless noted otherwise.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections may be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded moment connections for the entry canopy framing may be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Ultrasonic Inspection: ASTM E 164.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when

permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on setting nuts as detailed.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, unless noted otherwise.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

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ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING
SECTION 051213

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes architecturally exposed structural steel framing.

1. Requirements in Division 05 Section "Structural Steel Framing" also apply to AESS framing.

2. AESS on the project includes all steel framing at north and south entries, and north railing posts at retaining wall.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Structural Steel Framing" for additional requirements applicable to AESS.
3. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other metal items not defined as structural steel.
4. Division 05 Section "Metal Stairs."
5. Division 09 painting Sections for surface preparation and shop priming/painting requirements.

1.3 DEFINITIONS

A. Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.

B. Category 3 AESS in accordance with 2016 AISC Code of Standard Practice: All exterior architecturally exposed structural steel.

1.4 ACTION SUBMITTALS

A. LEED Submittals:

1. Product Data for Credit MR 4.1 and credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and

preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. Product Certificates for Credit MR 5.1 and credit MR 5.2: Documentation indicating location and distance from Project of material manufacturer and point of extraction, harvest or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Laboratory Test Reports for Credit IEQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS provided items of AESS are specifically identified and requirements below are met for AESS.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections. Indicate orientation of bolt heads.
5. Indicate exposed surfaces and edges and surface preparation being used.
6. Indicate special tolerances and erection requirements.

C. Samples: Submit samples of AESS to set quality standards for exposed welds for Category 3 AESS.

1. Two steel plates, 3/8 by 8 by 4 inches, with long edges joined by a groove weld and with weld ground smooth.
2. Steel plate, 3/8 by 8 by 8 inches, with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches, welded to plate with a continuous fillet weld and with weld ground smooth and blended.
3. Round steel tube or pipe, minimum 8 inches in diameter, with end of another round steel tube or pipe, approximately 4 inches in diameter, welded to its side at a 45-degree angle with a continuous fillet weld and with weld ground smooth and blended.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer fabricator.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Fabricator Qualifications: A qualified fabricator with a minimum of 5 years documented experience on projects of similar scope and complexity..

C. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.

1. Build mockup of typical portion of AESS as shown on Drawings.
2. Coordinate finish painting requirements with Division 09 painting Sections.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

PART 2 - PRODUCTS

2.1 BOLTS, CONNECTORS, AND ANCHORS

A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

2.2 FINISHING

A. Primer and Paint: Comply with Division 09 painting Sections.

2.3 FABRICATION

A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.

B. In addition to special care used to handle and fabricate AESS, comply with the following:

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
2. Grind sheared, punched, and flame-cut edges of Category 3 AESS to remove burrs and provide smooth surfaces and edges.
3. Fabricate Category 3 AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.
4. Fabricate Category 3 AESS with exposed surfaces free of seams.
5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
7. Fabricate Category 3 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
8. Seal-weld open ends of hollow structural sections with 3/8-inch closure plates for Category 3 AESS.
9. HSS seams shall not be visible when approaching the building.

C. Curved Members: Fabricate indicated members to curved shape by rolling to final shape in fabrication shop.

1. Distortion of webs, stems, outstanding flanges, and legs of angles shall not be visible from a distance of 20 feet under any lighting conditions.
2. Tolerances for walls of hollow steel sections after rolling shall be approximately 1/2 inch.
3. HSS seams shall face upward so that they are not visible from the ground.

D. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch with a tolerance of 1/32 inch for Category 3 AESS.

E. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.

F. Cleaning Corrosion-Resisting Structural Steel: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

H. Finish Closure Plate: Plates with countersunk tamper resistant stainless steel screws to cover the wire management openings for lighting and other work.

2.4 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
2. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.
3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where Category 3 AESS is exposed to weather.
4. Provide continuous welds of uniform size and profile where Category 3 AESS is welded.
5. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch for Category 3 AESS. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
6. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 3 AESS.
7. At locations where welding on the far side of an exposed connection of Category 3 AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
8. Make fillet welds for Category 3 AESS of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

2.5 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

2.6 SHOP PRIMING and PAINTING

A. Shop prime and paint steel surfaces per Division 09 painting Sections except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.

B. Preparing Galvanized Steel for Shop Priming: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

C. Surface Preparation for Nongalvanized Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 10/NACE No. 2, "Near White Blast Cleaning."

D. Priming and painting: Immediately after surface preparation, apply primer and paint systems according to manufacturer's written instructions per Division 09 painting Sections. Use methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

1. Erect Category 3 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.

B. Do not use thermal cutting during erection.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.
2. Orient bolt heads in same direction for each connection and to maximum extent possible in same direction for similar connections.

B. Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article.

1. Remove erection bolts in Category 3 AESS, fill holes, and grind smooth.
2. Fill weld access holes in Category 3 AESS and grind smooth.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AESS as specified in Division 05 Section "Structural Steel Framing." The testing agency will not be responsible for enforcing requirements relating to aesthetic effect.

B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

3.6 REPAIRS AND PROTECTION

A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.

B. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

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SECTION 052100
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. K-series steel joist substitutes.
3. Joist accessories.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Section 051200 "Structural Steel Framing"

1.3 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and professional engineer.

B. Welding certificates.

C. Manufacturer certificates.

D. Mill Certificates: For each type of bolt.

E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

F. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

1. Use ASD; data are given at service-load level.

2. Design special joists to withstand design loads with live-load deflections no greater than the following:
   a. Floor Joists: Vertical deflection of 1/360 of the span.
   b. Roof Joists: Vertical deflection of 1/360 of the span.
3. Design special joists to withstand design loads with total load deflections no greater than the following:
   a. Floor Joists: Vertical deflection of 1/480 of the span.
   b. Roof Joists: Vertical deflection of 1/480 of the span.

2.2 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Do not camber joists.

2.3 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

C. Bridging: Fabricate as indicated and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

D. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Hot-dip zinc coat according to ASTM A 123/A 123M.

E. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."

F. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.

G. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

H. Welding Electrodes: Comply with AWS standards.

I. Galvanizing Repair Paint: ASTM A 780/A 780M.

J. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E 165/E 165M.
   b. Magnetic Particle Inspection: ASTM E 709.
   c. Ultrasonic Testing: ASTM E 164.
   d. Radiographic Testing: ASTM E 94.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

3.4 PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

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STEEL DECKING
SECTION 053100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Cellular roof deck.
3. Noncomposite form deck.

B. Related Requirements:

1. Division 03 Section "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
3. Division 09 painting Sections for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4.1 and credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5.1 and credit MR 5.2: Documentation indicating location and distance from Project of material manufacturer and point of extraction, harvest or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Laboratory Test Reports for Credit IEQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Epic Metals Corporation.
2. Nucor Corp.; Vulcraft Group.
3. Canam United States; Canam Group Inc.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 CELLULAR ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Epic Metals Corporation.
2. Nucor Corp.; Vulcraft Group.
3. Canam United States; Canam Group Inc

B. Cellular Roof Deck: Fabricate panels, with top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 40 minimum, with G60 zinc coating, chemically cleaned and shop primed with a baked-on, rust-inhibitive primer that is compatible with the high performance coatings specified in division 09.
   a. Primer Color: White.
2. Cellular Deck Profile at west entry canopy: As indicated, with bottom plate.
3. Profile Depth: As indicated.

4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
6. Side Laps: Overlapped.

2.4 NONCOMPOSITE FORM DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Canam United States; Canam Group Inc.
2. Nucor Corp.; Vulcraft Group.
3. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: 1-1/2 inches.
3. Design Uncoated-Steel Thickness: 0.0474 inch.
4. Span Condition: As indicated.
5. Side Laps: Overlapped.

2.5 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated, or as recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 3/4 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in the field of roof and 6 inches apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws. Do not penetrate or deform bottom cellular panel.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

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COLD-FORMED METAL FRAMING
SECTION 054000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing wall framing.
2. Soffit and Miscellaneous framing.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4.1 and credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5.1 and credit MR 5.2: Documentation indicating location and distance from Project of material manufacturer and point of extraction, harvest or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: Provide shop drawings prepared by cold-formed metal framing manufacturer.
   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. INFORMATIONAL SUBMITTALS

E. Qualification Data: For testing agency

F. Welding certificates.

G. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

   1. Steel sheet.
   2. Expansion anchors.
   3. Power-actuated anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Horizontal drift deflection clips
   7. Miscellaneous structural clips and accessories.

H. Research/Evaluation Reports: For cold-formed steel framing.
   1. Metal stud manufacturer to have a third party evaluation report for its products that are reviewed to the local building code or its model code (IBC 2006 and AISI S100).

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

B. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA).

   1. Products to be certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies.

C. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

D. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI's "Code of Standard Practice".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing products manufactured by one of the following:
1. ClarkDietrich Building Systems.
2. Marino\WARE.
3. The Steel Network (TSN).
4. Approved products from manufacturers that are members of the SFIA.

2.2 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 955 for conditions indicated.

C. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST33H
2. Coating: G60, A60, AZ50, or GF30.

D. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1 or 2.
2. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, unless otherwise indicated.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches, unless otherwise indicated.

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:
   a. ClarkDietrich Building Systems.
   b. Marino\WARE.
   c. The Steel Network (TSN).
   d. Approved products from manufacturers that are members of the SFIA.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 2 inch, unless otherwise indicated.

2.4 SOFFIT AND MISCELLANEOUS FRAMING

A. Exterior Soffit and Miscellaneous Framing: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Steel Thickness: 0.0428 inch, unless otherwise indicated
2. Flange Width: 1-5/8 inches, unless otherwise indicated.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

C. Power-Actuated Anchors: Power actuated fasteners may not be used for fastening structural framing members. All connections shall be made by either self-tapping screws or welding unless otherwise indicated.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Approved Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed framing in accordance with ASTM C1007 and AISI S200 "North American Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints. Contractor shall field verify existing building joints not indicated on the Drawings.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches unless noted otherwise.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.
2. Connect vertical deflection clips to infill studs and anchor to building structure.
3. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

a. Install solid blocking at 96-inch centers.

2. Bridging: Cold-rolled steel channel welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and special inspector to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer, installer, and architect, to ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

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SECTION 054400
COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cold-formed steel trusses for roofs.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for cold-formed steel studs, joists, and rafters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel trusses.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Miscellaneous structural clips and accessories.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel trusses from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Aegis Metal Framing

B. Alpine TrusSteel, and ITW Company

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel roof truss framing and accessory components.

B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Deflection Limits: Design roof trusses to withstand design loads without deflections greater than the following:
   a. Live Load: Vertical deflection of 1/480 of the span.
   b. Total Load: Vertical deflection of 1/360 of the span.
3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

C. Cold-Formed Steel Framing Design Standards:

1. Roof Trusses: Design according to AISI S214.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL TRUSS MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

2.4 ROOF TRUSSES

A. Roof Truss Members: Manufacturer's standard steel sections.

1. Minimum Base-Metal Thickness: 0.428 inch.

2.5 ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of same grade and coating weight used for truss members.

B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless bolts, with encased end threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and Appendix D in ACI 318, greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Fasteners: Fastener system of type suitable for application, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the

design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Shims: Load bearing, of high-density multimonomer plastic, nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

2.8 FABRICATION

A. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate trusses using jigs or templates.
2. Cut truss members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting cold-formed steel trusses for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.

1. Fasten cold-formed steel trusses by welding or mechanical fasteners.
    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.

C. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

D. Truss Spacing: As indicated.

E. Do not alter, cut, or remove framing members or connections of trusses.

F. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

G. Erect trusses without damaging framing members or connections.

H. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.

I. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's TechNote 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses".

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections:

B. Field and shop welds will be subject to testing and inspecting.

3.4 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal trusses are without damage or deterioration at time of Substantial Completion.

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SECTION 055000
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
1. Steel stairs.
2. Exterior steel railings.
3. Interior steel railings.
4. Steel handrails.
5. Steel ladders.
6. Metal pan interior stair.
7. Steel lintels.
8. Steel bollards.
9. Metal grating.
10. Miscellaneous framing and supports.

1.2 QUALITY ASSURANCE

A. Qualify welding processes and welding operators in accordance with AWS. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved.

B. Comply with the latest editions of:
1. NAAMM Metal Stairs Manual AMP 510 including "Recommended Voluntary Minimum Standards for Fixed Metal Stairs for Commercial Class unless otherwise indicated.
2. NAAMM Metal Finishes Manual for Architectural and Metal Products.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's catalog sheets, specifications and installation instructions for specific products.

B. Shop Drawings: Submit shop drawings for fabrication and erection of all metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items.

C. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
a. Extended Producer Responsibility
b. Bio-Based Materials
c. Wood products certified by FSC or USGBC approved equivalent.
d. Materials Reuse

e. Recycled Content
f. USGBC approved program meeting leadership extraction criteria.

3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Coordinations: Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

C. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes and Bars (other than W-Shapes): ASTM A36.

B. Steel W Shapes: ASTM A992.

C. Steel Tubing: Cold-formed, ASTM A500; or hot-rolled, ASTM A513.

D. Steel Pipe: ASTM A53; Standard weight (Schedule 40).

E. Steel Sheet: Hot-rolled, ASTM A570 or cold-rolled ASTM A611.

F. Stainless Steel Pipe: ASTM A 312, Grade TP 304 (Type 316 at exterior locations), AISI No. 4 finish.

G. Stainless Steel Bar Stock: ASTM A 167, Type 302 or 304, (Type 316 at exterior locations), AISI No. 4 finish.

H. Stainless Steel Plate: ASTM A 167, Type 304, (Type 316 at exterior locations), AISI No. 4 finish.

I. Metal Grate:
   1. Basis for Design: McNichols aluminum bar grating, 1 ¼" x 3/16", Type 6063-T6, press lock.
      a. Bearing bar: 1.25" high x 0.1875 thick.
      b. Bearing bar spacing: 0.4375"
      c. Surface: Smooth
      d. Cross bar spacing: 4"
      e. Percent open: 54%
      f. Cross bar type: Rectangular

J. Exterior Stair Railing System: Wagner Ultra-Tec cable railing system.
   1. Material: Type 316 stainless steel.
   2. Posts: 1 1/2" diameter.
   3. Cable: CR6AS2, 3/16" diameter.
   4. Hardware: Invisawire system
   5. Post mount: Set in granite cap with epoxy grout.
   6. Pipe: Corner Posts with cable tube.

K. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
   1. Wall Return: Black iron, Model 604 by Julius Blum & Company, Inc. or accepted equal.
   2. Wall Brackets: Model 382 by Julius Blum & Company, Inc. or accepted equal.
   3. Pipe Cover Flanges: Model 211 by Julius Blum & Company, Inc. or accepted equal.

L. Welding Electrodes: E70 and in accordance with AWS.
   1. Provide low chloride rods for welding stainless steel.

M. Fasteners: Provide stainless steel fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

N. Shop Primer for Ferrous Metal: Fabricator's standard, fast-curing, lead-free, Series 10-1009 grey primer by Tnemec or accepted equal.

O. Galvanizing: Hot dipped zinc coating complying with ASTM A123 for fabricated products and ASTM A153 for hardware.

P. Nonshrink Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

2.2 FABRICATION, GENERAL

A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

B. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of

fabrication and support. Use type of materials indicated or specified for various components of work.

C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Base exposed edges to a radius of approximately 1/32" unless otherwise indicated.

D. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

E. Form exposed connections with hairline joints, flush and smooth using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.

F. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

G. Cut, reinforce, frill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

H. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weepholes where water may accumulate.

I. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC-SP6 "Commercial Blast Cleaning".

J. Shop Painting: Apply shop primer to surfaces of metal fabrication except those which are galvanized or indicated to be embedded in concrete or masonry, unless otherwise indicated and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

K. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:
   1. ASTM A153 for galvanizing iron and steel hardware.
   2. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strips 1/8" thick and heavier.

2.3 STEEL STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated; join pieces together by welding unless otherwise indicated. Provide complete stair assemblies including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure.

B. Stair Framing: Fabricate stringers of structural steel channels, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel headers and miscellaneous framing members as indicated.

C. Metal Pan Risers, Sub-treads, and Sub-platforms: Shape metal pans for risers and sub-treads to conform to configuration shown. Provide thicknesses of structural steel sheet for metal pans indicated, but not less than that required to support total design loading.
   1. Form metal pans of cold-rolled carbon steel sheet unless otherwise indicated.
   2. Attach risers and sub-treads to stringers by means of brackets made of steel angles or bars. Weld brackets to strings and attach metal pans to brackets by welding.
   3. Provide sub-platforms of configuration and construction indicated. Attach sub-platform to framing members with welds.

2.4 STEEL-FRAMED STAIRS

A. Provide complete stair assemblies, including metal framing, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations.

C. Stair Framing: Fabricate stairs with steel members as shown. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

D. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 12 gauge. Fabricate steel pan stair as detailed on drawings, to match existing stair.

2.5 STEEL HANDRAILS AND RAILINGS

A. Fabricate steel railings and handrails to design, dimensions and details indicated.

B. Provide steel handrails in Stairs 1, 2, and 3. Provide stainless steel handrails in Entry Lobby and Main Lounge.

C. Interconnect members by butt-welding.

D. Form simple and compound curves by bending in jigs to produce uniform curvature for each repetitive configuration required; maintain cross-section of members throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of member.

E. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.

F. Close exposed ends of railings by welding 3/16” thick steel plate.

G. Brackets, Flanges, Fittings and Anchors: Provide brackets, and guardrail miscellaneous fittings for attachment of railings.

2.6 STEEL LADDERS

A. Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3, unless otherwise indicated.

B. Unless otherwise indicated, provide 3/8" x 3" continuous structural steel flat bar side rails with eased edges, spaced 18" apart. Provide 3/4" diameter solid structural steel bar rungs, spaced 12" o.c.

C. Fit rungs in centerline of side rails. Plug, weld and grind smooth on outer rail faces.

D. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage and to hold ladder clear of the wall surface with a minimum of 7" clearance from wall to center line of rungs. Return rails to wall or structure.

2.7 STEEL LINTELS

A. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown.

B. Weld adjoining members together to form a single unit where indicated.

C. Provide not less than 8" bearing at each side of openings, unless otherwise indicated.

D. Hot dip galvanize all lintels in exterior walls, at bathrooms, and at shower rooms.

2.8 STEEL BOLLARDS

A. Provide bollards of steel pipe with minimum of 1/4" wall thickness.

B. Field weld caps after concrete placement. Grind smooth all welds.

C. Bollards shall be hot dip galvanized.

2.9 PREFABRICATED METAL GRATING

A. Span bearing bars the short direction unless otherwise shown. Place joints in bearing bars only over supports. Do not notch bearing bars at supports to maintain elevations.

B. Fabricate cutouts in grating sections for penetrations of sizes and at locations indicated. Cut openings neatly and accurately to size.

C. Fabricate removable bar gratings with stud bolt anchors welded to the supporting member. Design anchors to fit over two bearing bars and provide four anchors for each removable panel.

D. Edge band all grating at all edges and openings.

E. Fabricate hatches for smooth operation.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide miscellaneous steel framing and supports as required to complete work.

B. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing.

C. Except as otherwise indicated, fabricate from structural steel shapes, plates and steel bars of welded construction. Cut, drill and tap units to receive fasteners and similar items.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction.

B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus level, true and free of rack, measured from established lines and levels.

C. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication.

D. Touch-Up Painting: Clean and touch-up paint field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal.

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SECTION 057300
PREFABRICATED GLASS RAILING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
   1. Prefabricated glass railing system.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's catalog cut sheets and specifications for all components of each product type specified.

B. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

B. Shop Drawings: Submit shop drawings for fabrication layout and erection including plan views, elevations, sections and details. Show anchorage and accessory items.

C. Samples: Provide samples for each type of metal finish indicated on metal of same kind to be used in work.

D. Test Reports: Submit test reports from qualified independent testing agency indicating compliance with ASTM E 985.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have been engaged in the manufacture of railing systems for a minimum of five years.

B. Installer Qualifications: Engage an experienced Installer who has completed installation of railing systems similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance for a period of not less that 5 years.

C. Single Source Responsibility: Provide railing system from one source and produced by a single manufacturer.

1.4 PERFORMANCE REQUIREMENTS

A. Performance and Testing Requirements: Provide railing system conforming to the following standards:
   1. ASTM E 894 Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
   2. ASTM E 935 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
   3. ASTM E 985 Standard Specification for Permanent Metal Railing Systems and Rails for Buildings.

B. Thermal Action and Corrosion Control: Allow for thermal action resulting from the maximum range change in ambient temperature in the design, fabrication and installation of rail systems, to prevent opening of joints, buckling, and other detrimental effects, including over-stressing of connections and components.

C. Corrosion Resistance: Prevent galvanic action, and other forms of corrosion by isolating dissimilar metals to prevent them from being in direct contact with each other.

1.5 PROJECT CONDITIONS

A. Field Measurements: Check actual dimensions of other construction by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver handrails, guardrails, and railing systems and related components in protective packaging and store components to avoid damage from moisture, abrasion and other construction activities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Prefabricated Glass Railing System: Mirage with Glass by Livers Bronze or accepted equal.
   1. Guardrail Posts with side-mounted handrail.
      a. Material: 2-inch OD stainless steel tube, Type 304.
      b. Height: 42 inches.
      c. Spacing: 4'-0" on center maximum.
   2. Rails: 2” diameter beech.

3. Handrails: 1-1/2-inch OD stainless steel tube, Type 304.
4. Wall Bracket: WB-1051. Stainless Steel Wall Bracket Assembly. 4' 0" Maximum spacing.
5. Glass: 3/8" thick clear tempered plate glass.
   a. Glazing material: ANSI Z97.1.
   b. Field glaze glass panels.

2.2 FABRICATION

A. Fabricate handrails and railing systems to comply with manufacturers specifications for project design, details, dimensions, finish, and anchorage.

B. Fabricate railing system to comply with the Building Code of New York State Structural requirements as follows:
   1. Handrail and Guards: 50 plf (applied in any direction at any point along the top).
   2. Handrail and Guards: 200 lb concentrated load (applied in any direction at any point along the top.)
   3. Other Components including Intermediate Rails Balusters and Panels: 50 psf (horizontally applied normal load).

PART 3 - EXECUTION

3.1 PREPARATION

A. Field measure all conditions prior to fabrication and installation.

B. Verify and coordinate setting drawings, templates, and related items that are to be embedded in concrete and masonry.

3.2 INSTALLATION

A. Install railing system in accordance with manufacturer's instructions using manufacturer's trained installers or an installer acceptable to the specified manufacturer.

B. Install railing system plumb, level, square, true to line, and rigid.

C. Attach railing system securely in place using fasteners supplied or approved by manufacturer.

D. All embedded anchor plates and supporting steel shall be provided by another trade and coordinated with the railing supplier.

E. Attach railing system to supports as indicated on the drawings and as approved by manufacturer.

F. Field-weld components as approved by manufacturer.

G. Use manufacturer's supplied hardware.

H. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

I. Remove and replace defective or damaged components that cannot be successfully repaired as determined by Architect.

3.3 CLEANING AND PROTECTION

A. Immediately upon completion of installation, clean all railing system surfaces. Do not use abrasive agents or harsh chemicals. Provide plastic sheet protection for all surfaces of completed installations to prevent damage during remainder of construction activities.

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SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
1. Wood nailers, blocking, sleepers, furring, and equipment supports.
2. All carpentry not specified in other sections and generally not exposed to view.

1.2 QUALITY ASSURANCE

A. Reference Standards
1. American Softwood Lumber Standard, Voluntary Product Standard, National Bureau of Standards, U.S. Department of Commerce (PS).
2. AWPA Book of Standards, American Wood Preservers Association, Bethesda, Maryland (AWPA) and American Wood Preserves Bureau (AWPB) Standard.
3. National Design Specification for Wood Construction, National Forest Products Association, Washington, D.C.
4. U.S. Product Standard PSI-83/ANSI A199.1 for Construction and Industrial Plywood, U.S. Dept. of Commerce.
5. Performance Standards and Policies for Structural Use Panels, PRP-108, American Plywood Association (APA).
6. APA Design/Construction Guide, Residential and Commercial, American Plywood Association.

B. Lumber Standard: Comply with DOC PS 20 for each indicated use.

C. Plywood Standard: Comply with PS 1 for each indicated use.

D. Factory-mark each piece with type, grade, mill and grading agency name.

E. Forest Certification: Provide rough carpentry produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC's "Principles and Criteria for Forest Stewardship."

1.3 SUBMITTALS

A. Product Data
1. Fasteners and anchors.

B. Certification
1. Certification of lumber treatment.

C. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of

raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Product Handling, Delivery, and Storage: Keep materials dry at all times. Protect against contact with damp or wet surfaces. Stack to provide air circulation. Protect exposed materials against weather.

B. Coordination: Fit to other work; scribe and cope for accurate fit. Correlate supports and backing for other work to allow proper attachment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber
   1. General: Dressed S4S nominal sizes indicated (except as indicated by detail dimensions) with 19% maximum moisture content at time of dressing.
   2. Miscellaneous Framing and Blocking: "Construction Grade" S-P-F or better, Surfaced Dry.

B. Pressure Treated Lumber
   1. General: Southern Yellow Pine, No. 2 or better, dressed S4S nominal sizes indicated (except as indicated by dimensions).
   2. Standards: Comply with the applicable requirements of the American Wood-Preservers' Association.
   3. Treatment:
      a. Pressure-treat with one of the following waterborne, arsenic and chromium free preservatives.
         i. Alkaline Copper Quaternary.
         ii. Copper Azole.
      b. Kiln-dry to maximum 19% moisture content.
      c. Mark each treated item with the AWPA Quality Mark Requirements.
      d. Minimum Preservative Retention: In accordance with the specified standard, determined in the specified zone, for the following applications:

i. Ground or fresh water contact.

4. Fasteners: Stainless steel.

C. Fire Treated Plywood(Interior Use):
1. Location: backing panels for electric and telecom support.
2. Hoover PyroGuard or approved equal.

D. Fasteners: Galvanized polebarn or galvanized common for untreated wood. Stainless steel for preservative treated wood. Comply with recommendations of APA Design/Construction Guide-Residential and Commercial for plywood nailing or screwing. Stapling not acceptable.

E. Bolts: ASTM A307; Use galvanized bolts for untreated wood and stainless steel for preservative treated wood.

F. Fastening systems for concrete, masonry and steel: Expansion anchors, adhesive anchors and powder-actuated fasteners, by Hilti Fastening Systems or accepted equal. Galvanized for untreated wood and stainless steel for preservative treated wood. Sizes as noted on drawings.

G. Adhesive
1. Contech PL-400 or accepted equal.
2. Contech PL-500 or accepted equal for pressure treated wood.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General
1. Discard units of material with defects able to impair quality of work and units which are too small to use in fabricating work with optimum joint arrangement.
2. Set carpentry accurately to required levels and lines, with members plumb (or sloped as indicated) and true.
3. Securely anchor and fasten to substrates as indicated and as required by recognized standards.
4. Provide washers under bolt heads and nuts in contact with wood. Countersink bolts and nuts flush with surfaces unless otherwise shown.
5. Install fasteners without splitting wood, predrill as required.
6. Install framing connectors and specialty fasteners according to manufacturer's instructions.

B. Nailers and Blocking
1. Provide where indicated and where required to attach other work. Coordinate location with other work.
a. All wood blocking, nailers or plywood that is in contact with masonry, concrete, in wet locations or as indicated on the Contract drawings shall be pressure treated.

2. Form to shapes as indicated and cut as required for true line, level or plane of work to be attached.
3. Attach securely to substrates with fasteners as indicated and as required to support applied loading.
4. Install plumb and level with closure strips at edges and openings.
5. Tolerances: Shim and level wood furring to a tolerance of 1/8" in 10'-0".

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SECTION 061643
NONCOMBUSTIBLE SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Gypsum wall sheathing.
   2. Gypsum coverboard.

1.2 QUALITY ASSURANCE

A. Standards: Comply with the latest edition of the following.
   1. Gypsum Association GA-253, Recommended Specifications for the Application of Gypsum Sheathing.
   2. Gypsum Association GA-600, Fire Resistance Design Manual.
   3. United States Gypsum, Gypsum Construction Handbook.
   4. AWPA Book of Standards, American Wood Preservers Association, Bethesda, Maryland (AWPA) and American Wood Preserves Bureau (AWPB) Standard.
   5. U.S. Product Standard PSI-83/ANSI A199.1 for Construction and Industrial Plywood, U.S. Dept. of Commerce.
   6. Performance Standards and Policies for Structural Use Panels, PRP-108, American Plywood Association (APA).
   7. APA Design/Construction Guide, Residential and Commercial, American Plywood Association.

B. Plywood Standard: Comply with PS 1 for each indicated use.

C. Factory-mark each piece with type, grade, mill and grading agency name.

1.3 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's product information for each gypsum sheathing component.
   2. Fasteners and anchors.

B. Certification
   1. Certification of lumber treatment.

C. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse

e. Recycled Content
f. USGBC approved program meeting leadership extraction criteria.

3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

C. Warranty: Submit manufacturer's standard five year limited warranty against manufacturing defects for gypsum products.

1.4 JOB CONDITIONS

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer.

B. Store materials inside under cover to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage. Neatly stack flat to prevent sagging.

C. Comply with referenced standards and recommendations of gypsum board manufacturer before, during and after application of gypsum board.

D. Coordination: Fit to other work; scribe and cope for accurate fit. Correlate supports and backing for other work to allow proper attachment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gypsum Sheathing (Exterior Walls and Soffits): Dens-Glass Gold Sheathing by G.P. or accepted equal. 5/8" thick type X, ASTM C1177, square edges and square ends with inorganic fibermat surfacing.

B. Gypsum Sheathing (Metal Roof Deck): 5/8" Dens-Deck type X fiberglass faced gypsum roof board by Georgia Pacific or accepted equal.

C. Screws: ASTM C954 No. 6, bugle head, self-tapping, zinc/cadmium/stainless finish in lengths as recommended by manufacturer. Comply with Federal Specifications for screws and as follows:
1. Type S-12: For gypsum sheathing for 12-22 gauge steel framing.
2. Type S: For gypsum sheathing to 24 gauge or lighter steel framing.
3. Type W: For gypsum sheathing to wood blocking or framing.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 GYPSUM SHEATHING INSTALLATION

A. Wall/Partition Support Systems
   1. Comply with referenced standards of Gypsum Association and manufacturer's recommendations.
   2. Arrange boards in the direction and manner to minimize the number of joints. Use appropriate length material to avoid end joints. Edge joints to be parallel to and occur over framing members. End joints, if required, to be staggered.
   3. Install face side out, discarding imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
   4. Attach gypsum board to supplementary framing and blocking at openings and cutouts. Fit sheathing snugly around all openings.
   5. Fasteners to be located no closer than 3/8" from the edge and the ends of the sheathing panels. Space fasteners at 8" on center at perimeter edge and end supports and at 8" on center at intermediate framing. Fasteners to be driven so as to bear tight against and flush with the surface of the sheathing panels. Do not countersink.
   6. Exposure after installation: Following installation, gypsum sheathing may be left exposed to the elements for up to one month.

B. Gypsum Protection Board Installation (attic deck):
   1. Install gypsum board sheets with long lengths perpendicular to roof deck, with mechanical screw fastening. Allow for 1/8” gap between adjacent sheets.
   2. Seal all joints as recommended by sheathing manufacturer.

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SECTION 062023
INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
1. Closet shelves and rods.
2. Shelf hardware.
3. Cabinet hardware.

1.2 QUALITY ASSURANCE

A. Standards
1. Woodwork: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI).
2. Softwood Lumber: PS 20"American Softwood Lumber Standard" and applicable grading agency rules for species and products indicated.
3. Plywood
a. ANSI/HPVA HP-1"American National Standard for Hardwood and Decorative Plywood".
b. ANSI PS 1 Construction and Industrial Plywood.
4. Wood Molding and Millwork Producers Association:
a. WMMPA HWM 1: HWM Series Hardwood Molding Patterns
b. WMMPA HWM 2: General Requirements for Hardwood Molding
c. WMMPA WM 4:General Requirements for Wood Molding
d. WMMPA WM 12: WM/Series Wood Molding Patterns

5. Forest Stewardship Council: Provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, “FSC Principles and Criteria for Forest Stewardship.”

1.3 SUBMITTALS

A. Product Data: Submit product data for factory fabricated items.

B. LEED Submittals
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures’ self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
a. Extended Producer Responsibility
b. Bio-Based Materials
c. Wood products certified by FSC or USGBC approved equivalent.
d. Materials Reuse
e. Recycled Content
f. USGBC approved program meeting leadership extraction criteria.

3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

C. Shop Drawings: Submit for shop fabricated items including dimensioned plans and elevations, large-scale details, attachment devices and other components.

D. Samples
1. Submit sample for each fabricated project.

1.4 JOB CONDITIONS

A. Product Delivery, Storage and Handling
1. Protect finish carpentry during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
2. Do not deliver finish carpentry until painting, wet work, grinding and similar operations which could damage, soul or deteriorate finish carpentry have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.
3. Do not install until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

B. Coordination
1. Hardware: Coordinate fabrication, installation and finishing with finish hardware provided elsewhere.
2. Field Measurements
a. Where finish carpentry is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings.
b. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Shelving (painted finish)
1. MDO exterior grade plywood, overlay both sides with edge banding on exposed edges suitable for finish painting.
2. 3/4” thick.

B. Shelf Hardware: Knape and Vogt or accepted equal.
   1. Shelf Standards and Brackets: #87 ANO & 187 ANO (Anochrome finish).
   2. Shelf Standards and Clips: #255 NP & 256 NP (nickel-plate finish).
   3. Closet Rod and Supports
      a. Rod: #770-5, heavy wall (.120") steel tubing, 1-5/16" OD. Bright chrome finish.
      b. End Flange: #764 CHR (polished chrome finish).
      c. Shelf and Rod Support: #1195 (painted finish).

C. Miscellaneous Materials
   1. Fasteners for Interior Finish Carpentry
      a. Nails, screws, and other anchoring devices of type, size, material and finish required for application indicated to provide secure attachment, concealed where possible.
      b. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A153.
   2. Anchors
      a. Provide hot-dip galvanized anchors and inserts by Hilti Fastening Systems or accepted equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 PREPARATION

A. General
   1. Clean substrates of projections and substances detrimental to application.
   2. Condition materials to average prevailing humidity conditions in installation areas prior to installing.

3.3 INSTALLATION

A. Do not use finish carpentry materials that are unsound, warped, bowed, twisted, improperly treated or finished, not adequately seasoned, or too small to fabricate with proper jointing arrangements.

B. Do not use manufactured units with defective surfaces, sizes or patterns.

C. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims.

D. Install to a tolerance of 1/8" in 8'-0" for plumb and level and 1/32" maximum offset in flush adjoining surface, 1/8" maximum offsets in revealed adjoining surfaces.

E. Anchor woodwork to blocking or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish.

3.4 CLEANING AND PROTECTION

A. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

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SECTION 064000
ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Plastic laminate countertops.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.

B. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

C. AWI Quality Standard: Comply with applicable requirements or "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

D. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC's "Principles and Criteria for Forest Stewardship."

E. Comply with LEED requirements regarding chain of custody certification for fabricators.

1.3 SUBMITTALS

A. Product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing and installation, including cabinet hardware.

B. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.

C. Samples for initial selection purposes of the following in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures and patterns available for each type of material indicated.
   1. Plastic laminate.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:

a. Extended Producer Responsibility
b. Bio-Based Materials
c. Wood products certified by FSC or USGBC approved equivalent.
d. Materials Reuse
e. Recycled Content
f. USGBC approved program meeting leadership extraction criteria.

3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Delivery, Storage and Handling
1. Protect woodwork during transit, delivery, storage and handling to prevent damage, soilage and deterioration.
2. Do not deliver woodwork until painting, wet work, grinding and similar operations that could damage, soil or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions".

B. Project Conditions
1. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0% of optimum moisture content from date of installation through remainder of construction period.
2. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated.

B. Plastic Laminate: Formica, Nevamar or Wilsonart. Provide patterns, colors and finishes from manufacturer's full collection.
   1. Horizontal Surfaces: GP-50 (0.050" nominal thickness).
   2. Vertical Surfaces: GP-50 (0.050" nominal thickness).
   3. Adhesives: Water-resistant glue applied under heat and pressure.
   4. Laminate Color: to be selected by Architect:

C. Fiberboard: Premier MDF medium density fiberboard by Williamette Industries or accepted equal.

D. Counter Support Bracket: Eclipse counter bracket by Rakks or accepted equal. Provide clear aluminum finish.

E. In-Wall Counter Support Bracket: EH-1818FM inside wall mount bracket by Rakks or accepted equal. Provide EH-PP-22 anodized aluminum face plate at each location.

F. Support Legs: Model TL, height as noted on Drawings, 4" diameter round legs, matte black with glide leveler by Doug Mockett and Company or accepted equal.

G. Grommets: EDP Series grommet liner and cap, 3" diameter (2-1/2" hole) by Doug Mockett and Company or accepted equal.

H. Cabinet Hardware: Refer to drawings for cabinet hardware required for architectural cabinets and for a complete installation and as follows:
   1. Pulls: DP238A by Doug Mockett or accepted equal, satin nickel finish; 5" center to center width and 1" surface projection of accepted equal. Countersink screws at inside face of drawer front. Provide two pulls for drawers over 24" wide.
   2. Catches: Double action, spring tension, nylon roller type. On all tall cases, heavy duty, spring tension, rubber roller type.
   3. Locks: Heavy duty cylinder type with phosphor bronze 5 tumbler springs and brass barrels on all doors and drawers. Provide 3 non-duplicative keys for each lock and 3 master keys for each master key group. Provide satin chrome finish.
   4. Drawer Slides: BLUM Blumatic 230M drawer runner or accepted equal. 3/4" extension runner; epoxy coated steel with self-lubricating nylon rollers; 100 lbs. static load/75lb. dynamic load capacity or accepted equal.
   5. Hinges: Concealed European 170° self-closing hinges finished in brushed satin chrome.

I. Base Molding: Extruded vinyl, 4" high. Provide on exposed sides and fronts of floor mounted cabinets with matching corner pieces, Color to be selected by Architect.

J. Fasteners and Anchors: Provide screws, nails and anchors of material, type, size and finish required for secure anchorage.

2.2 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles and details indicated. Ease edges to radius indicated for the following:

1. Corners and edges of members less than 1" in nominal thickness 1/8".
2. Edges of rails and similar members more than 1" in nominal thickness 1/8".

C. Complete fabrication, including assembly, finishing and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming and fitting.

D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates of roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

2.3 ARCHITECTURAL COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 and its Division 400C.

B. Grade: Premium.

C. Edge Treatment: Plastic laminate GP-50 if not otherwise indicated on drawings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work is to be installed. Do not proceed until all unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Deliver anchoring devices to be built into substrates well in advance of time substrates are to be built.

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required.

3.3 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified for type of woodwork involved.

B. Install woodwork plumb, level, true and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Countertops: Anchor securely to base units and other support systems as indicated. Radius inside corners of cutouts 1/8" minimum. Miter all "L" counters.

3.4 ADJUSTMENT AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

3.5 PROTECTION

A. Provide final protection that ensures that woodwork is without damage or deterioration.

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SECTION 064100
MOLDED STONE PANELS

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included
   1. Molded Stone Panels.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.

B. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

1.3 SUBMITTALS

A. Product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing and installation, including cabinet hardware.

B. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.

C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures and patterns available.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk

programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Molded Stone Panels: QuarryCast Molded Stone by Formglas Inc., or accepted equal.
   1. QuarryCast molded stone units are manufactured with:
      a. Integral pigmented neutral calcium sulphate based cements, aggregates glassfiber reinforcing - no asbestos is permitted.
      b. Factor-applied clear (non-gloss) sealer.
      c. Built-in reinforcing ribs where required by the manufacturer for attachment or strength.
   2. Color: Seattle Sand.
   3. Texture: Standard.
   4. Coating: Anti-graffiti Coating.

B. Grout: QuarryCast matching grout by Formglas Inc. or accepted equal.
   1. Fasteners: Fasteners as recommended by manufacturer.
   2. Adhesive: Installer to use a manufacturer recommended adhesive to ensure proper adhesion of parts and prevent bleed through.

PART 3 - EXECUTION

3.1 STORAGE AND HANDLING

A. Store molded stone units level on a clean and dry surface in an area protected from weather and damage. Do not “lean” the unit since warpage may occur.

B. Site Conditions: Verify the conditions for compliance with the requirements including environmental conditions, installation tolerances and other conditions affecting the installation and performance of Molded Stone parts. Any unsatisfactory conditions to be corrected prior to installation.

C. Field Dimensions: Field dimensions to be verified including those not shown on the drawings. Any discrepancies are to be brought to the attention of the Architect with resolutions to the discrepancies to be mutually agreed upon by all parties involved. Details of any required changes must be incorporated into the manufacturer’s shop drawings prior to commencing the manufacture of the Molded Stone parts.

3.2 PREPARATION

A. It is the installer’s responsibility to order the correct material quantities (including a waste allowance) and he shall verify dimensions and conditions for inclusion into the shop drawings.

B. Ensure that the substrate or back-up is straight and true.

3.3 INSTALLATION

A. Some warpage may occur due to climatic or storage conditions. Carefully wet the back only with a brush and water and bend the part back into the required shape during fastening. "Over wetting" may stain the surface. Contact the manufacturer if warpage is excessive.

B. Cutting: Unless noted, molded stone parts come in standard sizes only. Field cutting and mitering will be required.
   1. Table, cut-off or radial arm saw with diamond saw or "Metal cutting" (abrasive) wheel - i.e. Makita 305 mm (12" - A.01345. Carbide tipped blades work well but "dull" quicker. Sawzall with tungsten carbide blade - i.e. Milwaukee #4800-1420.
   2. Mini-grinder with 102 mm (4") dia. diamond cutting saw.
   3. ("Veneer" panels can be cut with a Richard Plastic Laminate Cutter (hand tool) if "cutting" dust poses a problem. Score the panel face and back various times and snap (break) the panel along a straight edge. The panel edge will be rough and requires sanding after.)
   4. "Wet" cutting is not to be attempted.

C. Edge Finishing After Cutting
   1. Sand "cut" edges on moldings etc. with a sanding block or mini sander (#36 grit).

D. Installation and Attachments
   1. Position the Molded Stone parts carefully into place and align with adjacent parts and materials in accordance to the drawings. Attach Molded Stone parts to substrates with adhesives as specified by the manufacturer and use concealed shims as required.
   2. Apply walnut size dabs of adhesive on the panel back on approx. 229mm (9") o.c., and slide into position.
   3. To hold the panels temporarily in position and flat, use an "Air Nail Gun" with 18 ga/ nails for plywood.
   4. Premade outside 90° "Veneer" corners can be supplied. Other outside corners shall be field mitered, grouted and "bevel" sanded as per "Installation Instruction" sketches. Sharp outside corners should not be attempted, inside corners can be butt jointed.

E. Joint Treatments
   1. Dry Joints: Butt the molded stone units and leave joints dry.
   2. Caulk between molded stone panels and dissimilar materials unless dry joints are preferred.

F. Caulked Joints: Most available caulking compounds are compatible.

G. Hole Filling: Finger fill holes with matching grout and remove excess grout immediately with a flexible scraper or damp cloth. The grout will blend in after approx. 24 hours. Do not smear the grout on the QC surface beyond the hole.

H. Patching
   1. Broken Corners: Refit dry or-re-attach with (clear) wood glue.
   2. Large Cracks & Chips: Fill as described in "Hole Filling" above. Use grout sparingly.
   3. Scratches and Gouges: Because of the QC texture, superficial scratches will not detract from the general appearance.

4. Deep scratches or gouges can be “hand sanded” out with #80-#100 sandpaper and coated after with the clear sealer.

I. Cleaning and Maintenance
   1. QuarryCast requires generally little upkeep other than cleaning with a water/soap solution and rinsing with a sponge.
   2. Excessive dirt, pencil and rubber marks, etc. can be removed with a multipurpose spray cleaner such as “Spray Nine” by Knight’s (no powders) and wiping after with a damp cloth or sponge. If the area is large it will require resealing.
   3. To remove stains, burns etc. contact manufacturer.

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SECTION 066116
SOLID SURFACE FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
1. Solid polymer countertops.
2. Solid polymer sinks.
3. Solid polymer window sills.
4. Solid polymer post partition system.

1.2 QUALITY ASSURANCE

A. Fabricator/installer certified by the manufacturer shall be used for fabrication and installation to ensure compliance with the warranty and assure a quality installation.

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.

B. Samples: Submit minimum 6" x 6" samples of selected color and pattern.

C. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.

D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions.

E. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Deliver no components to project site until areas are ready for installation. Store indoors.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Solid Polymer: Corian by DuPont or accepted equal. Color to be selected from categories A, B, C, or D. Thickness to be 1/2" for all applications.

B. Solid Polymer Sink: Corian Model 810S with seamed undermount by Dupont or accepted equal. Color to be Glacier White. Top, apron and backsplash shall be 1/2" solid polymer as shown on the Architect's Drawings.

C. Adhesive Fillers and Sealants: Manufacturer's standard or recommended materials.

D. Sink/Bowl Mounting Hardware: Manufacturer's approved bowl clips, panel inserts and fasteners for attachment of undermount sinks/bowls.

E. Solid Polymer Post Partition System: By Lumicor or accepted equal. Architect to select panel color from full range of colors.
   1. Floor to ceiling post system. Contractor to verify dimensions in the field.
      a. SL-PROF-100 1 ¼" diameter structurelite profile, full height. Color to be clear anodized aluminum.
      b. Top Mounts
         (a). EZ-A2.5WMBL 2 ½" diameter wall mount bracket with counterbored hold for low head. Fasten with #8 clear anodized aluminum mounting screws.
         (b). HD-LHD14 5/16-18 x 2" black low head socket cap screw
         (c). HD-NW1 5/16" dia. x ½" od x 1/32 nylon washer (white)
         (d). HD-HJN3 5/16-18 zinc hex jam nut
      c. Bottom Mounts
         (a). EZ-A2.5WMBL 2 ½" dia. wall mount bracket with counterbored hole for lowhead. Fasten with 8# clear anodized aluminum aluminum.
         (b). HD-LHD10S 5/16-18 x 1" low head zinc plated steel socket cap screw.
      d. Grippers
         (a). EZ-AGRIP-500 EZ-Rod ½" material gripper assembly. Grip to be clear anodized aluminum.
         (b). HD-LHD7 5/16-18 x 3/8" black low head socket screw cap.
         (c). HD-S15 5/16-18 x 3/8" stainless steel cup point socket screw.
         (d). EZ-A41-500 clear anodized aluminum surface mount clip for ½" material.
         (e). HD-FDA1 #6-12 all purpose off-white anchor x 1 1/8" long. Drill size to be ¼"
      e. Panel: 0.472", price group D, as selected by Interior Designer.

2.2 FABRICATION

A. General: All fabrications shall be made using solid polymer of thickness as shown on drawings or if not showing 1/2". Fabrications shall be adhesively jointed with no exposed seams and having edge details as indicated on drawings. No exposed fasteners shall be allowed.

B. Factory fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings.

C. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.

D. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.

E. Cut and finish edges with clean, sharp returns. Rout radii and contours to template.

F. Coved Backsplashes: Field fabricate 1/2" radius cove at intersection of counters and backsplashes. Form backsplashes using 1/2" solid polymer.

G. Allowable Tolerances
1. Variation in component size: ±1/8".
2. Location of openings: ±1/8" from indicated location.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surface to receive work and conditions under which work will be installed. Do not proceed with work until all satisfactory conditions are corrected.

3.2 INSTALLATION

A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and product installation data.

B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

C. Adhere undermount sink to countertops using manufacturer's recommended adhesive and mounting hardware.

D. Provide backsplashes and side splashes as indicated on the drawings. Adhere to countertops using manufacturer's standard color-matched adhesive.

E. Remove adhesives, sealants and other stains. Replace stained components.

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SECTION 072100
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
1. Fiberglass insulation.
2. Subgrade insulation.
3. Masonry insulation.
4. Rigid insulation.
5. Vapor barrier.
6. Sill sealer.
7. Thermal acoustic insulation

1.2 QUALITY ASSURANCE

A. Thermal Conductivity
1. Thicknesses indicated are for thermal conductivity (k-value at 75°F or 24°C) specified for each material. Adjust thicknesses as directed for equivalent use of material having a different thermal conductivity.
2. Where insulation is identified by "R" value, provide thickness required to achieve value.

B. Fire Performance Standards
1. Surface Burning Characteristics: ASTM E84.
2. Fire Resistance Ratings: ASTM E119.
3. Combustion Characteristics: ASTM E136.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.

B. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
a. Extended Producer Responsibility
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3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or

Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 PRODUCT HANDLING

A. General Protection: Protect insulation from physical damage.

B. Protection for Plastic Insulation
   1. Shield from sunlight, except as necessary during installation and concealment.
   2. Deliver material to project site at installation time. Install and conceal as rapidly as possible in each area of work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fiberglass Batt Insulation: Unfaced Thermal Batt Insulation by Owens Corning or accepted equal. Thickness as noted on drawings.

B. Subgrade Insulation: Styrofoam Square Edge Insulation by Dow or accepted equal. 2" thick extruded polystyrene insulation board with square edges on all sides.

C. Underslab Insulation: Highload 100 by DOW Chemical or accepted. 2" thick extruded polystyrene insulation board with minimum 100 psi compressive strength.

D. Interior Z-Furring Insulation: Styrofoam Z-Mate by Dow or accepted equal. 2" thick x 23-1/8" wide extruded polystyrene insulation board with square edges to fit between Z-furring channels.

E. Exterior Rigid Insulation: Thermax Heavy Duty by Dow or accepted equal. Thickness as noted on drawings. Provide 48" wide extruded polystyrene insulation board with shiplap edges. Provide Thermax self-sealing, fully adhered flashing over all seams.

F. Vapor Barrier: Clear 6-mil polyethylene film, with laboratory tested vapor transmission rating of 0.2 perms, per ASTM E96.

G. Class A Vapor Barrier: Viper CS-10, or accepted equal, 10 mil triple ply, extrusion coated, virgin polyethylene membrane with woven high density fibers.

H. Air Barrier: Henry HE200AM Metal Clad Weather Barrier or accepted equal including all manufacturer's recommended fasteners and flashing products at perimeter of all doors, windows, curtain wall, and other wall openings.

I. Mechanical Anchors: Type and size indicated or if not indicated, as recommended by insulation manufacturer for type of application and condition of substrate.

J. Sill Sealer: Fiberglass insulation fabricated in strip form width to match width of sill member, 1 inch nominal thickness compressible to 1/22 inch.

K. Masonry Insulation: Zonolite by W.R. Grace or accepted equal.

L. Thermal/Acoustic board insulation (TA): Roxul Rockboard PG with perforated white polypropylene facing or approved equal, including all manufacturer's recommended fasteners.
   1. Location: Attach to underside of concrete slab above Mechanical Room, Electrical Room and Fire Pump Room.
   2. Flame Spread: = 25
   3. Smoke Developed = 50
   4. Fasteners: Stainless steel.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Examine substrates and conditions affecting insulation work; proceed with work only when satisfactory conditions exist or have been produced.

B. Remove from substrates any substances harmful to (or projections able to puncture) insulation or vapor barriers.

3.2 INSTALLATION

A. General
   1. Comply with manufacturer's instructions for installation under each condition.
   2. Extend insulation the indicated full thickness over entire area to be insulated. Cut and fit tightly around obstructions and insulate voids.
   3. Insulate in a single layer unless otherwise indicated to achieve required thickness.

B. Batt Insulation
   1. Apply units to substrate as indicated; if no specific method is indicated, anchor mechanically to place and support units permanently.
   2. Stuff portions of units neatly into miscellaneous voids as required.
   3. Do not obstruct ventilation spaces.

C. Insulation at Foundation Walls
   1. Butt sheets tightly together at all joints.
   2. Spot bond insulation to vertical surfaces with mastic as recommended by insulation manufacturer and waterproofing manufacturer.

D. Rigid Board Insulation
   1. Butt sheets tightly together at all joints and Zee furring.
   2. Tape all seams at butt joints, Zee furring, concrete slabs, concrete beams, windows and door openings, and penetrating objects.

E. Wall Vapor Barrier Installation/Air Infiltration Barrier Installation
   1. Pursue objectives of complete coverage and optimum practical continuity in barrier at all insulated exterior surfaces.
   2. Lap edges of sheets not less than 4".
   3. Tape/seal joints and seams.

4. Tape/seal to all penetrating objects including doors, windows and other wall openings, using manufacturer's recommended materials and installation procedures.
5. Repair punctures and tears in barriers immediately before concealing with other work; cover with vapor barrier tape or adhesive-applied vapor barrier material.
6. At locations where vapor barrier is exposed to the interior of the building, and not covered with gypsum drywall, provide Class A vapor barrier.

3.3 PROTECTION

A. General: Protect installed insulation and vapor barriers from harmful weather exposures and from possible physical abuse.

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SECTION 072210
INDOOR AIR QUALITY TESTING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, other Division-1 Specification sections, and specifications of materials mentioned in this section, apply to this section.

1.2 WORK INCLUDED:

A. General: This section provides requirements Baseline Indoor Air Quality (IAQ) Testing for maximum indoor pollutant concentrations for acceptance of the facility to comply with Executive Order 111. DASNY will contract with Genesys to perform the scope of work herein.

1.3 RELATED WORK:

A. Sequencing of installation of finish materials during construction to avoid IAQ contamination of building systems will be specified in the Construction IAQ Management Plan developed by the Contractor.

B. Cleaning of HVAC system including all duct work, air intakes and returns, and changing of filters.

C. Manufacturer's data shall be supplied for products, including content and outgassing of emissions.

1.5 QUALITY ASSURANCE:

A. Baseline IAQ Testing will be conducted using protocols consistent with the United States Environmental Protection Agency "Compendium of Methods for the Determination of Air Pollutants in Indoor Air."

1.6 SEOUENCING AND SCHEDULING:

A. All measurements shall be conducted prior to occupancy, but during normal occupied hours and with building ventilation systems starting at the normal daily start time and operated at a minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
B. The building shall have all interior finishes installed, including but not limited to millwork, doors, paint, carpet, and acoustic tiles. Non-fixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
C. The testing shall be arranged to allow for a round of testing to occur at the date of substantial completion. Final testing should be scheduled for final completion date.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 BASELINE IAQ TESTING:

A. HVAC System Verification: To assure compliance with recognized standards for indoor air quality including ASHRAE Standard 62.1-2004 the Contractor's independent testing and balancing agency shall verify the performance of each HVAC system including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.

B. Indoor Air Quality Testing: Upon verification of HVAC system operation, the General Contractor shall hire an independent testing agency, subject to approval by the Contracting Officer's Representative, with a minimum of 5 years experience in performing the types of testing specified herein, to test levels of indoor air contaminants for compliance with specified requirements.

1. A test plan shall be submitted for the approval of the Contracting Officer's Representative. The plan shall specify procedures, times, instrumentation, and sampling methods that will be employed.
2. For each portion of the building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft., or for each contiguous floor area, whichever is larger, and include areas with the least ventilation and the greatest presumed source strength. The Contracting Officer's Representative is the sole judge of areas exempt from testing.
3. Sample and record outside air levels of formaldehyde and TVOC contaminants at outside air intake of each respective air handling unit simultaneously with indoor tests to establish basis of comparison for these contaminant levels.
4. Air samples shall be collected between 3' and 6' from the floor over a minimum 4-hour period.
5. Acceptance of respective portions of buildings by the Owner is subject to compliance with specified limits of indoor air quality contaminant levels.
6. For each sampling point where the maximum concentration limits are exceeded based on the Table 1, conduct additional flushout with outside air and retest the specific parameter(s) that were exceeded to indicate the requirements were achieved. Repeat the procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test.
7. If any test fails the standard, the General Contractor is responsible to ventilate the building with 100% outside air until the building passes both air quality tests and duct inspections. Any costs associated with retesting shall be borne by the General Contractor at no additional expense to the Owner.
8. All levels must be achieved prior to acceptance of the building. The levels do not account for contributions from office furniture, occupants, and occupant activities.

D. Indoor air quality shall conform to the following standards and limits as outlined in the 6NYCRR Part 638.7(d)(1) as referenced by Executive Order 111.

Table 1 MAXIMUM CONTAMINANT CONCENTRATION LEVELS

Chemical Contaminants	Maximum Air Concentration Levels
Formaldehyde	27 parts per billion
Particulates (PM 10)	50 micrograms per cubic meter
Total Volatile Organic Compounds (TVOC)	500 micrograms per cubic meter
*4-Phenylcyclohexene (4-PCH)	6.5 micrograms per cubic meter
Carbon Monoxide	9 parts per million and no greater than 2 parts per million above outdoor levels

*This test is only required only if carpets and fabrics with Styrene Butadiene (SB) latex backing material are installed as part of the base building systems.

A. Test Reports: Prepare test reports showing the results and location of each test, a summary of the HVAC operating conditions, a listing of any discrepancies and recommendations for corrective actions, if required.
   a. Include certification of test equipment calibration with each test report.

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SECTION 072400
SYNTHETIC STUCCO SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Synthetic stucco systems.

1.2 QUALITY ASSURANCE

A. Installer should be thoroughly experienced with finish system installation and have a minimum of five years experience in this type of work.

1.3 SUBMITTALS

A. Product Data: Submit specifications, installation instructions and general recommendations from manufacturer.

B. Samples: Submit color and texture samples for selection of color and texture.

C. Field Constructed Mock-ups: Prior to installation erect sample panels to further verify selections made for color and textural characteristics. Represent completed work for qualities of appearance, materials and construction. Comply with the following requirements:
   1. Locate mock-ups on site as directed by Architect.
   2. Build one mock-up of approximately 4' long by 4' high of each color and finish selected.
   3. Include specially detailed joints.
   4. Retain mock-ups during construction as standard for judging completed work. When directed, demolish and remove from site.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk

programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Application of this system shall be in ambient temperatures above 40˚F and rising and on unfrozen surfaces.

B. A minimum ambient temperature of 40˚F shall be maintained for at least 24 hours after finish has been applied.

1.5 DELIVERY, STORAGE AND HANDLING

A. All coating materials shall be delivered in their original sealed containers bearing manufacturer's name and identification of project with written application instructions and appropriate health, hazard and safety data.

B. All ready-mixed coating materials shall be protected from extreme heat, sun and frost. Factory proportioned bagged materials shall be stored inside off the ground in a dry area and protected from moisture.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Synthetic Stucco System: STO System F300 by Sto or accepted equal as follows:
   1. Ground Coat: STO Leveler.
   2. Primer: STO Primer.
   3. Finish Coat: STO Stolit with 1.0 aggregate.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which the work is to be installed. Do not proceed with the work until all unsatisfactory conditions are corrected.

B. Inspect surfaces for
   1. Contamination -- algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, laitance, mildew or other foreign substances.
   2. Surface absorption and chalkiness.
   3. Cracks -- measure crack width and record location of cracks.
   4. Damage and deterioration.
   5. Moisture content and moisture damage -- use a moisture meter to determine if the surface is dry enough to receive the Air Barrier Membrane and Synthetic Stucco materials and record any areas of moisture damage.
   6. Compliance with specification tolerances -- record areas that are out of tolerance (greater than 1/4 inch in 8-0 feet [6mmin 2438 mm] deviation in plane).

C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the Air Barrier Membrane or Synthetic Stucco installation to the General Contractor, Site Representative, and Architect.

3.2 SURFACE PREPARATION

A. Do not begin work until masonry restoration has been completed.

B. High pressure wash existing masonry surfaces to receive Synthetic Stucco System to remove surface contaminants.

C. Apply conditioner by sprayer or roller to chalking or excessively absorptive surfaces.

D. Replace weather damaged sheathing and repair damaged or cracked surfaces.

E. Level surfaces to comply with required tolerances.

3.3 SYNTHETIC STUCCO SYSTEM INSTALLATION

A. Mix and apply ground coat to fill and patch voids/irregularities in the surface and to achieve a smooth, plumb surface. Apply ground coat in one application to a maximum thickness of 1/2" by hand toweling. Allow to dry.

B. Apply primer with brush, roller or spray and allow to dry thoroughly before applying finish.

C. Apply textured finish coat in a minimum 1/16" thick, uniform layer over all ground coated surfaces. Apply finish in a continuous operation without cold joints or other visible lines. A wet edge shall be maintained. Continuous work shall proceed toward joints and corners. Texture finish as required to match approved sample.

3.4 PROTECTION

A. Provide protection of installed materials from water infiltration into or behind the system.

B. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

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SECTION 074113
METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Prefabricated metal roofing system.
   2. Roof insulation.
   3. Metal gutters and downspouts.
   4. Snow retention system.

B. Work Specified Elsewhere: Sheet Metal Flashing and Trim Section 076200.

1.2 QUALITY ASSURANCE

A. Standards - Comply with latest edition of the following:
   1. SMACNA, "Architectural Sheet Metal Manual".

B. Manufacturer: Company specializing in Architectural Sheet Metal Product with ten (10) years minimum experience.

C. Performance Requirements: Provide sheet metal roofing that has been manufactured, fabricated and installed to withstand structural and thermal movement, wind loading and weather exposure to maintain manufacturer's performance criteria without defects, damage, and failure of infiltration of water.
   1. Wind-Uplift: Roof panel assembly shall comply with UL Classification 580 for UL Classified 90 rated assemblies.
   2. Static Air Infiltration: Completed roof system shall have a maximum of .06 cfm/sf with 6.24 kPa air pressure differential as per ASTM E283/1680.
   3. Water Infiltration: No evidence of water penetration or an inward static air pressure differential of not less than 6.24 psf (43 kPa) and not more than 12.0 psf (8. kPa) as per ASTM E331/1646.

1.3 SUBMITTALS

A. Product Data: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material, fasteners and fabricated product.

B. Shop Drawings: Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing and accessories. Show details of weatherproofing, terminations and penetrations of metal work.

C. Samples: Submit selection and verification samples for finishes, colors and textures.

D. Performance Tests:
   1. Submit certified test results by a recognized testing laboratory in accordance with specified test methods for each panel system.

E. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.

F. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

G. Uplift Calculations: Provide uplift and fastener calculations sealed by a Professional Engineer licensed in the State of NY. Calculations shall include securement for field, perimeter and corner zones of metal roof system.

H. Snow Retention System Calculations: Include calculation of number and location of snow guards based on snow load, roof slope, panel length and finish and seam type and spacing.

1.4 JOB CONDITIONS

A. Field Measurements: Verify actual measurements by field measurements before fabrication, show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

B. Coordinate this work with adjoining work to sequence each installation properly; ensure best possible weather-resistance and durability of work, plus protection of materials and finishes.

1.5 DELIVERY, STORAGE AND HANDLING

A. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.

B. Panels with strippable film must not be stored in the open, exposed to the sun.

C. Stack all materials to prevent damage and to allow for adequate ventilation.

1.6 WARRANTY

A. Paint finish shall have a thirty five (35) year guarantee against cracking, peeling and fade.

B. Applicator shall furnish guarantee covering watertightness of the roofing system for the period of two (2) years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Prefabricated Metal Roofing: A1300 standing seam panel system by Englert, Inc. or accepted equal.
1. All panels shall be continuous from eave to ridge. No horizontal panel joints will be permitted.
2. Provide 1 1/2" height standing seam with continuous interlock and 2500 series 05082H floating top clip with 05082l floating base clips for UL 90 rating.
3. Provide 16" panel width.
4. All sheet materials shall be 24 gauge G-90 hot-dipped galvanized A50 steel with smooth profile.
5. All sheet materials shall have ULTRA Cool finish in compliance with LEED requirements for reflectivity and emissivity. Color to be selected by Architect from complete line of manufacturer's standard colors. Panel underside shall have manufacturer's standard polyester paint coatings.
6. Provide all panels with factory eave notching.
7. Field cutting of panels is not allowed.
8. Provide factory applied sealant bead.
9. Provide manufacturer's standard flashing and trim profiles and as indicated on the contract drawings, factory formed, and gauge as recommended by manufacturer, color and finish to match metal roofing panels.
10. Recycled Content: Provide steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Bearing Plates at rigid insulation: 20 gauge galvanized bearing plates.

C. Roof Underlayment: Englert Metal Man HT High Temperature Underlayment by Englert, Inc. or accepted equal. Provide 40 mil thick membrane of polyethylene weave and modified polyolefin coatings able to resist high temperature beneath metal roof.

D. Roof Insulation
1. Rigid closed-cell polyisocyanurate with manufacturer's standard fiber reinforced felt facing both sides. Comply with ASTM C1289 (Grade 1) and FS HH-I-1972/2 Class 1, except compressive strength shall be 20 psi.
2. Maximum board size shall be 4'-0" x 4'-0".
3. Provide insulation in minimum of two layers to achieve thickness shown on drawings.
4. Provide taper/layout as indicated on drawings.

5. Tapered edge strips shall be used to make transitions between level changes of ½" or more.
6. Provide a minimum aged R value of 5.6 per inch of thickness, with a minimum of 6" thickness.

E. Sealant: Silpruf by General Electric or accepted equal.

F. Snow Guards: #4000 series aluminum two pipe guard with spacing at 18" o.c. attached to standing seam with 1" diameter aluminum tube, one ice flag per panel. Provide stainless steel set screws. Color to match standing seam roof.

G. Snow Pads: #81 Aluminum standing seam snow pad at 12" o.c. attached to standing seam. Color to match standing seam roof.

H. Gutter and Downspout System: Half round 24 gauge G-90 hot-dipped galvanized A50 steel gutter and 6" diameter downspout. Provide size and configuration as shown on drawings. Provide in material and finish to match roofing system unless otherwise noted on drawings. Gutter and downspout bracket to match roof color. Downspout from bracket to grade to match Alpolic Champagne Mica Metallic.

I. Vent Thru Roof Flashing: Roof Jack by Dektile or accepted equal. Color to match roofing.

J. Fasteners: Provide fasteners as required by roofing manufacturer and listed for use for sheathing substrate.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General
1. Comply with manufacturer's installation instructions and recommendations.
2. Comply with details indicated and with SMACNA "Architectural Sheet Metal Manual".
3. Anchor work securely in place by methods indicated, providing for thermal expansion of metal units.
4. Conceal fasteners where possible and set units true to line and level as indicated.
5. Install laps, joints and seams permanently watertight and weatherproof.
6. Separations: Separate metal from noncompatible metal or corrosive substrates as manufacturer recommends.

7. Fabricate seams as specified, detailed or indicated by SMACNA for specific installation condition.
8. Expansion Provisions: Fabricate as specified, detailed or indicated by SMACNA for specific installation condition.

B. Gypsum Board

1. Install gypsum board sheets with long lengths perpendicular to roof deck, with mechanical screw fastening. Allow for 1/8" gap between adjacent sheets.

2. Install only that amount of gypsum board that can be covered during one day's operations. Replace all damaged material prior to insulation installation.

C. Roof Insulation
   1. Extend full thickness in two or more layers following the manufacturer's approved shop drawings over entire surface to be insulated, cutting and fitting tightly around obstructions.
   2. Stagger joints a minimum of 6 inches.
   3. Limit joints between adjacent units to 1/8" maximum.
   4. Installing Insulation with Mechanical Fasteners at new metal deck: Fasten insulation with mechanical fasteners spaced in conformance with manufacturer's requirements with fully adhered insulation at roof deck.
   5. Discard insulation that contains moisture.

D. Coverboard
   1. Install coverboard with long lengths perpendicular to insulation board. Allow for 1/8" gap between adjacent sheets.
   2. Install only that amount of coverboard that can be covered during one day's operations.
   3. Set each board in a full spray application or in ribbons of insulation adhesive. Press each board into the adhesive to provide a firm and uniform attachment.

E. Roofing Underlayment
   1. Surfaces to receive metal roofing shall be covered with roofing underlayment in conformance with manufacturer's recommendations.
   2. Apply the membrane in valleys before the membrane is applied to the field of the roof.
   3. Apply membrane from the low point to the high point of the roof firmly pressing to deck. Apply membrane horizontally with minimum 4" sidelaps and 6" endlaps.

F. General Metal Fabrication
   1. Shop-fabricate work to greatest extent possible.
   2. Fabricate for waterproof and weather-resistant performance, sufficient to permanently prevent leakage, damage or deterioration of work.
   3. On site roll forming, field cutting panels and other fabrication methods not acceptable.
   4. Brake-form all sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated. Fold back edges to form hems.
   5. Form work to fit substrates.
   6. Comply with material manufacturer's instructions and recommendations for forming material.

G. Prefabricated Metal Roofing System
   1. Install preformed roof panels, gutters and prepainted metal accessories and flashings in compliance with manufacturer's recommendations and SMACNA standards. Panels should be installed so all horizontal lines are level and vertical lines are even.

2. All roof panels shall be fastened to the roof deck with non-penetrating hold down clips at spacing as required by manufacturer to achieve UL Classified 90 uplift. Fasteners shall be concealed as provided by manufacturer.
3. All seams shall be mechanically field seamed using manufacturer's approved equipment and techniques.

H. Snow Retention System: Install snow rails in accordance with manufacturer's written specifications.

I. Gutter and Downspouts: Install gutters and downspouts in accordance with manufacturer's written instructions, drawings and SMACNA standards.

J. Gutter Screens: ¾" - #13 standard expanded metal, 80% open, type 304 stainless steel screen as manufactured by McNichols item 4800341348 or equal.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances able to corrode metal or deteriorate finishes.

B. Protection: Ensure undamaged or undeteriorated work, other than natural weathering, at time of substantial completion.

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SECTION 074200
COMPOSITE STONE PANELS

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included: Composite Stone Panels.

B. Related Work Specified Elsewhere:
   1. Section 054000 – Cold Formed Metal Framing
   2. Section 076200 – Sheet Metal Flashing and Trim
   3. Section 079200 – Joint Sealants

1.2 REFERENCE STANDARDS

A. ASTM E 283 Test Method for Rate of Air Leakage

B. ASTM E 331 Test Method for Water Penetration

C. AAMA 501.1 Test Method for Dynamic Water Penetration

D. ASTM E-84 Test Method for Measuring Flame Spread

E. UFC 4-010-01 Unified Facilities Criteria (UFC) - DoD Minimum Antiterrorism Standard for Buildings.

1.3 SUBMITTALS

A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Division 1. Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract."

B. Quality Assurance/Control Submittals:
   1. Test Reports: Submit independent laboratory certified test reports showing compliance with specified performance characteristics.
   2. Building Authority Acceptance: Submit documentation confirming Building Code Authority Acceptance.

C. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.

d. Materials Reuse
e. Recycled Content
f. USGBC approved program meeting leadership extraction criteria.

3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

C. Substitutions:
1. General: Refer to Division 1 Substitutions for procedures and submission requirements.
2. Substitution Documentation:
a. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
b. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for system performance criteria, and (2) has been engaged in the design, manufacture and fabrication of natural stone honeycomb reinforced wall cladding system for a period of not less than ten (10) years, and (3) able to provide a list of previous projects of similar size and scope with references. (Company Name and Contact Information) and (4) confirm acceptance by the controlling building code authority.
c. Test Reports: Submit independent laboratory test reports verifying compliance with each test requirement for Exterior Natural Stone Honeycomb Reinforced Wall Cladding System required by the project.
d. Product Sample and Finish: Submit product sample, representative of panel system for the project with specified stone type and finish.

1.4 WARRANTY

A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.

B. Manufacturer's Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty as follows:

Warranty Period: Ten (10) years from Date of Substantial Completion that the panel will be free from defects in lamination or separation of panel components.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer Qualifications: Manufacturer shall have a minimum of 10 years demonstrated capability to produce reinforced stone veneer panels of the quality and scope required. Manufacturer shall have completed independent laboratory tests verifying performance capabilities and shall be able to furnish a list of references and previous projects of similar size and scope. Manufacturer must have acceptance by the appropriate building code authority with established ongoing building authority quality control. Manufacturer shall be

capable of providing detailed shop drawings, field service representation during construction, and approval of acceptable installers and approval of application method.

2. Installer Qualifications: Installer to demonstrate experience (as determined by contractor) to perform work of this section and who has specialized in the installation of work similar to that required for this project and is deemed acceptable to product manufacturer.
3. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.
4. Panel System Performance Requirements:
   a. U.S. Code Approval – Per International Code Council (ICC-ES) Report ESR – 1500
   b. Accelerated Aging by Acid Freeze Thaw by Wiss, Janney, Elstner Assoc. Test Method: Flexural strength loss not to exceed 20% following 100 cycles + 170 (F) to -10(F) while immersed in 4-pH sulfuric acid solution.
   c. Large Missile Impact in accordance with Dade County Protocol PA 201-94: Resists large missile impact when fired at 50 ft. per second.
   d. Cyclic Wind Pressure Loading in accordance with Dade County Protocol PA 203-94: Resist 1342 repetitions of positive – negative 90 psf design wind pressure.
   e. ASTM E-84 Flame Spread: 5 maximum smoke development: 5 maximum. Fuel contributed: 0.
   f. Toxicity evaluation according to the University of Pittsburgh test method: No more toxic than Douglas fir wood.
   g. ASTM D-2015 Potential heat of combustion: 1150 BTU/lb. Maximum.
   h. UBC 17-6 Multi –Story fire evaluation: Meet acceptance criteria.
   i. Modified ASTM E-108 Fire evaluation: Resist 30 minute fire exposure.
   j. Flat wise tension bond capacity: 385 psi following accelerated aging by rapid temperature cycling from -40 degrees (F) to +160 degrees (F).
   k. Flat wise tension bond tests following ASTM C-67, section 8 freeze – thaw: 290 psi flat wise tension bond following 100 cycles freeze thaw consisting of 20 hours freezing at 0 degrees (F) and 4 hours thawing in water at 75 degrees (F).
   l. ASTM E-72 Transverse load test: Average 215 lbs. per sq. ft. uniform load on 35.5 inch simple span causing 0.49 inch deflection average.
   m. Racking shear load tests: No disengagement or major damage following application of 4,000 lb. load and 0.05" to 1.5" deflection on an 8 ft. x 8ft specimen.
   n. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft2 at a static air pressure differential of 6.24 psf.
   o. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 10 psf as defined in AAMA 501.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle material and components to avoid damage. Protect material against damage from elements, construction activities, and other hazards before, during and after installation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Composite Stone Panels: Honeycomb reinforced natural stone wall cladding system, StoneLite® by StonePly Suite A 4400 Oreal Greenville, TX 75404 Telephone: (903) 454-0904 or web: www.stoneply.com or accepted equal.
1. Natural Stone Honeycomb Reinforced Wall Cladding System:
2. Material Standard: Natural stone bonded to lightweight (aircraft quality) aluminum honeycomb having epoxy impregnated glass cloth skins.
3. Facing: 1/4" natural stone.
4. Reinforcing: ¾" aluminum honeycomb bonded by high strength epoxy impregnated reinforced glass cloth.

B. ACCESSORIES
1. Narrow interlocking channel system: Provide interlocking channels, connection and anchorage hardware, angle clips, threaded inserts and fasteners as required for a complete installation.

C. RELATED MATERIALS
1. Sealants: Sealant materials specified in section 079200 shall be tested for compatibility with the natural stone honeycomb reinforced wall cladding specified.

2.2 FABRICATION

A. General:
1. Fabricate components on the structure intended to receive panels per manufacturer's installation instructions and with minimum clearances and shim spacing.

2.3 STONE TYPE AND FINISHES

A. Stone:
1. CSP-1: Indiana Oolitic Limestone Grade and Color: Select buff, according to grade and color classification established by ILI or accepted equal.
1. CSP 2: Polished Carnelion by Cold Spring Granite, or accepted equal.

2.4 SOURCE QUALITY CONTROL

A. Source Quality: Provide Natural Stone Honeycomb Reinforced Wall Cladding System specified herein from a single source.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify existing substrate conditions are acceptable for product installation in accordance with manufacturer's instructions. Verify modules

are sized to receive natural stone honeycomb reinforced wall cladding system in accordance with manufacturer's acceptable tolerances.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication. Confirm recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

3.2 INSTALLATION

A. General: Install lightweight honeycomb reinforced natural stone panel systems plumb, level and true to line, with manufacturer's prescribed tolerances and installation instructions. Provide supports and anchor in place.

B. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.

C. Weather Tight Construction: Refer to installation instructions and consult sealant manufacture for project specific application. Coordinate installation with wall flashings and other components of construction.

D. Related Products Installation Requirements:
1. Sealants (Perimeter): Refer to Section 7 Joint Treatment (Sealants).

3.3 PROTECTION AND CLEANING

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect stone facing from damage from harmful contaminants.

B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

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SECTION 074213
METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Metal wall panel system.

1.2 QUALITY ASSURANCE

A. Performance Test Standards: Provide preformed panel systems which have been pretested and certified by manufacturer to provide specified resistance to air and water infiltration and structural deflection and failure when installed as indicated.

B. Field Measurements: Where possible, prior to fabrication of prefabricated panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

C. Fabricator Qualifications: The Fabricator shall have been in business of a similar trade and under the present company name for at least five (5) years prior to the start of this project, and experience with similar sized ACM Panel System projects, and fabricated at least three (3) successful projects of the specified ACM Panel System within the last five (5) years. The Fabricator must be capable of providing field service representation during installation.

D. Installer Qualifications: The Installer shall have been in business of a similar trade and under the present company name for at least five (5) years prior to the start of this project, and experience with similar sized ACM Panel System projects, and installed at least three (3) successful projects of the specified ACM Panel System within the last five (5) years. The Installer must be capable of providing field service representation during installation.

E. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, and system manufacturer's installation details.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, standard details, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

B. Samples: Submit samples of manufacturer's color samples for initial selection purposes and samples on metal substrates for final selection purposes.

C. Shop Drawings: Submit small scale layouts of panels on walls and large scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures and special details. Distinguish between factory and field assembly work.

D. Mock-Up Size: Provide as detailed in the construction documents if a stand-alone Mock-Up is required.

E. Warranty: Manufacturer's 20 year warranty on factory finish.

F. Maintenance: Submit Manufacturer's recommendations document for Cleaning and Maintenance of the Panel System.

G. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Protect finish and edges in accordance with panel manufacturer's recommendations.

B. Store material in accordance with panel manufacturer's recommendations.

1.5 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Material Warranty: Submit, to the Owner, the Manufacturer's standard warranty.
   1. Material and Product Integrity: Five (5) years against delamination at any manufactured bond line
   2. PVDF Painted Finish: Twenty (20) years against:
      i. Chalking in excess of a numerical rating of eight (8) when measured in accordance with ASTM D4214.
      ii. Fading or change color in excess of eight (8) E units (NBS) when calculated in accordance with ASTM D2244, paragraph 6.3.

iii. Cracking, chipping, splitting, blistering, or peeling. Minute fracturing (i.e. crazing or cracking) as a result of routing and bending of the ACM panels shall be excluded.

C. Shop-Fabrication Warranty: Fabricator shall submit to the Owner a standard warranty document executed by an authorized company official. The warranty shall be in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.
   1. Workmanship: One (1) year warranty period commencing on Date of Substantial Completion.

D. Installation Warranty: Installer shall submit to the Owner a standard warranty document executed by an authorized company official. The warranty shall be in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.
   1. Workmanship: One (1) year warranty period commencing on Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Panel System: Omega Lite Clip and Caulk system, by Laminators, Inc. or accepted equal.
   1. Panels
      a. Composite Panels: Polyallomer, corrugated core between aluminum skins, Class A finish.
         i. Backer: 0.013 aluminum.
         ii. Face: 0.32 aluminum.
         iii. Finish: Kynar 500
         iv. Color: Custom to match Alpolic Color Mica MCU Champagne. (www.aploci-northamerica.com)
      b. System: Route and Return
      c. Product Test Performance
         i. Panels shall be capable of withstanding building movements and weather exposures based on the following test standards.
         ii. Wind Load: Panels shall be designed to withstand 20 pounds per square foot (psf). Wind load testing shall be conducted in accordance with ASTM E330-84 to obtain the following results:
            (a). Normal to the plane of the wall between supports, deflection of the secured perimeter framing members shall not exceed L/175.
            (b). Normal to the plane of the wall, the maximum panel deflection shall not exceed L/60 of the full span.
            (c). Maximum anchor deflection shall not exceed 1/16".
         iii. Air Infiltration: When tested in accordance with ASTM E283-84, air infiltration at 1.57 psf must not exceed 0.06 cfm/ft2 of wall area.
         iv. Water Infiltration: No water infiltration shall occur in any system under a differential static pressure of 6.24 psf after 15 minutes of exposure in accordance with ASTM E331-86.
         v. Bond Integrity: When tested for bond integrity, in accordance with ASTM D1781-76, there shall be no adhesive failure of the bond (a) between the core and the skin nor (b) cohesive failure of the core.

vi. Fire Performance
(a). ASTM E84-79: Flame Spread 0, Smoke Developed 0.
(b). ASTM E162: No surface flaming.

d. Recycled Content: Provide steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2. Panel Fabrication
   a. Composition: Two sheets of aluminum sandwiching a core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials.
   b. Aluminum Face Sheets
      i. Thickness: .032".
      ii. Face: Smooth.
      iii. Color: Architect to select from Series A colors.
   c. Panel Weight: 6mm (0.25"): 1.99 lbs./ft^2.
   d. System Characteristics
      i. System must provide a wet seal (caulked) reveal joint.
      ii. System must not have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
      iii. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F. Fabricate panel system so that no restraints can be placed on the panel which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature changes and at all times remain air and water tight.
      iv. The finish side of the panel shall have a removable plastic film applied prior to fabrication which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

3. Accessories
   a. Trim pieces: the provide the following manufacturers trim pieces at the following conditions:
      i. Drip Cap 4525x: Inside soffit corners at perpendicular walls or aluminum curtain wall.
      ii. J- Trim 4515x: Inside vertical wall intersections.
      iii. J-trim- 4515x and Z-trim-4545 connected: Fascia soffit or Outside corner intersection.
   b. Flashing: 0.040" minimum thickness aluminum sheet finished to match the adjacent curtain wall/panel system where exposed.
   c. Fasteners: Fasteners as recommended by panel manufacturer. Do not expose fasteners.
   d. Sealant and Backer Rod: See Section 079200 – Joint Sealants.

PART 3 - EXECUTION

3.1 INSPECTION

A. Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Erect panels plumb, level, and true.

B. Anchor panels securely per manufacturer's recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.

C. Conform to panel fabricator's instructions for installation of concealed fasteners.

D. Do not install component parts which are observed to be defective, including; warped, bowed, dented, abraised, and broken members.

E. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in a visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement for new parts.

F. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

3.3 CLEANING AND PROTECTION

A. Remove and replace panels damaged as a direct result of panel installation.

B. Remove masking film as soon as possible after installation.

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SECTION 075423
THERMOPLASTIC POLYOLEFIN ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Thermoplastic Polyolefin (TPO) roofing system.
   2. Roofing system accessories.
   3. Roof insulation.

1.2 QUALITY ASSURANCE

A. Manufacturer: Obtain single ply membrane roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.

B. Installer: A firm which is acceptable to or licensed by manufacturer of primary roofing materials.

C. Preconstruction Conference: Prior to installation of roofing and associated work, meet at project site with Architect, General Contractor, roofing installer, installers of related work and roofing manufacturer's representative. Review methods and procedures related to roofing system including, but not limited to, the following:
   1. Meet with the Owner, Architect, Roofing Installer, Roofing System Manufacturer's representative, and installers whose work interfaces with or affects roofing.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
   1. Exterior Fire-Test Exposure: Class A; ASTM #108, for application and roof slopes indicated.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, installation instructions and general recommendations from manufacturers for roofing materials and accessories. Include data substantiating that materials comply with requirements.

B. Shop Drawings, indicating the following:
   1. Outline of roof and size.
   2. Deck type.
   3. Roof insulation manufacturer, brand and thickness.
   4. Layout of tapered roof insulation.
   5. Roof slope and direction of slope.
   6. Details.
   7. Location and type of all penetrations.
   8. Special conditions.

C. Samples
   1. Single ply membrane.
      a. Membrane.
      b. Flashing.
      c. Termination Bar.
      d. Edge Metal.
   2. Roof insulation.
   3. Fasteners.
   4. Recovery Board.

D. Fastener Pullout Tests: Submit results of fastener pullout tests substantiating compliance with manufacturer's requirements.

E. Warranty
   1. Manufacturer's representative shall inspect the installation of the roofing system upon completion when presented for system warranty consideration.
   2. Warranty and Maintenance Agreement: Upon completion of the Roofing System and as a condition of its acceptance, deliver two (2) copies of the Roofing Contractor's Guarantee and Warranty as specified in Part 3.

F. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or

Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

3. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

G. Quality Control Submittals

1. Fire Hazard Certification: Written certification that the roof system, including the specific insulation, has been tested in conjunction with the type of structural roof deck and roof slope applicable to the project and has achieved either an Underwriters Laboratories Class A or B external fire resistance rating as determined by tests conducted in conformance with UL 790 or ASTM E 108.
   a. Acceptable Certification: Letter from Underwriters Laboratories, or a copy of the Underwriters Laboratories classification listing for the roofing system.
2. Interior Fire Spread Certification: Written certification that the insulation when covered with the approved roof covering passes the tests of FM 4450 or UL 1256 when tested as an assembly.
3. Wind Uplift Certification: Submit written certification that the roof system, including the specific insulation and fasteners, has been tested in conjunction with the type of structural roof deck applicable to this project will resist the wind loading noted on the drawings to comply with the Building Code of New York State, and has achieved a Factory Mutual Wind Uplift rating when tested in conformance with FM 4450 or FM 4470 as follows:
   a. Class I-75 for all areas where the basic design wind speed is less than or equal to 75 mph as required by the Building Code of NYS.
   b. Acceptable Certification: Letter from Factory Mutual, or a copy of the Factory Mutual Approval Report for the roofing system.
4. Impact Resistance Certification: Submit written certification showing resistance to impact damage based on testing conducted in accordance with ASTM D 3746, ASTM D 4272 or FM 4470.
5. Accelerated Weathering Certification: Submit written certification showing physical integrity of the roofing based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G 23, ASTM G 26 or ASTM G 53.
6. Material Certification: Written certification from the roofing membrane manufacturer certifying that the insulation, insulation fasteners (if any), flashings and accessory products provided by the membrane manufacturer are approved for use with the roofing system and are included in the “20 year full system warranty”.

1.4 JOB CONDITIONS

A. Product Handling

1. Deliver materials in manufacturer's original, unopened containers.
2. Store all materials except membrane between 60°F and 80°F. If exposed to lower temperatures, restore materials to 60°F minimum before using.
3. Store all materials, except membrane, in dry area and protected from water and direct sunlight.
4. Damaged or deteriorated materials shall be replaced at Contractor's expense.

B. Environmental Requirements

1. Weather: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.
2. Coordinate installation of other roofing systems, flashing and other work to ensure proper sequencing.

C. Safety Requirements
1. All application, material handling and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.
2. Comply with federal, state and applicable fire and safety requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Single Ply Roofing Systems: Sure-Weld Fleece Back Adhered Roofing System by Carlisle, or accepted equal.
1. Membrane: TPO FleeceBack 135 mil thick (80 mil TPO and 55 mils of fleece.
a. Color: White
b. Solar Reflectance Index: 88
c. Thermal Emittance (ASTM E408): .95
2. Flashing and Stripping: .045-in. nominal thickness overall, scrim reinforced ethylene propylene-based (EP) membrane. Unreinforced .055-in.-thick, Ethylene Propylene-based membrane shall be supplied for field-fabricated flashings for vent stacks, pipes, drains and corners.
3. Adhesives, Sealants, Primers and Caulks
a. Fleece bonding adhesive.
b. All purpose sealant.
c. Cut edge sealant.
d. Seam cleaner.
e. Bonding adhesive.
4. Termination Bar.
5. Edge Metal Systems.
6. Roof Walkways: Sure-Weld Walkway Roll heat welded to the membrane.
7. Prefabricated Pipe Flashings.
8. Prefabricated TPO Corners.

B. Gypsum Board at metal deck and insulation Cover Board: 1/2" Dens-Deck Roof Board by Georgia Pacific or accepted equal.

C. Roof Insulation
1. Rigid closed-cell polyisocyanurate with manufacturer's standard fiber reinforced felt facing both sides. Comply with ASTM C1289 (Grade 1) and FS HH-I-1972/2 Class 1, except compressive strength shall be 20 psi.
2. Maximum board size shall be 4'-0" x 4'-0".
3. Provide insulation in minimum of two layers to achieve thickness shown on drawings.
4. Provide taper/layout as indicated on drawings.
5. Tapered edge strips shall be used to make transitions between level changes of ½" or more.
6. Provide a minimum aged R value of 5.6 per inch of thickness, with a minimum of 6" thickness.

D. Tapered Rigid Fiberboard: High density fiberboard complying with FL LLL-I-535B Class E.

E. Vapor Barrier: CCW-725 Air and Vapor Barrier by Carlisle or accepted equal.

F. Crickets: Rigid roof insulation tapered or cut as indicated.

G. Roof Curbs: By Division 23.

I. Insulation Fasteners: Metal fastening devices as recommended by manufacturer to suit substrate and windload conditions.

J. Membrane Adhesive: FAST 100 by Carlisle or accepted equal for adhering membrane to protection board and protection board to insulation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Contractor shall be responsible for protection of property during course of work. Adjacent completed work shall be protected from damage. Repair damage at no extra cost to Owner.

B. Roofing, flashings, membrane repairs, and insulation shall be installed and sealed in a watertight manner on same day of installation or before arrival of increments weather.

C. At start of each work day drains within daily work area shall be plugged. Plugs to be removed at end of each work day or before arrival of inclement weather.

D. Preparation work shall be limited to those areas that can be covered with installed roofing material on same day and before arrival of inclement weather.

E. Arrange work sequence to avoid use of newly constructed roofing for storage areas, walking surface, and equipment movement, Move equipment and ground storage areas as work progresses.

3.3 INSTALLATION OF GYPSUM BOARD

A. Install gypsum board sheets with long lengths perpendicular to roof deck, with mechanical screw fastening. Allow for 1/8" gap between adjacent sheets.

B. Install only that amount of gypsum board that can be covered during one day's operations. Replace all damaged material prior to insulation installation.

3.4 INSTALLATION OF VAPOR BARRIER

A. Apply vapor barrier over clean, dry surface.

B. Apply primer to deck in conformance with manufacturer's recommendations.

C. Apply vapor retarder as in conformance with manufacturer's recommendations.
   1. Apply membrane from low to high point, in a shingle fashion, so that laps will shed water.
   2. Overlap all edges at least 2 ½".
   3. End laps shall be staggered.
   4. Place membrane carefully so as to avoid wrinkles.
   5. Immediately after installation, roll with a 100 lb. roller wrapped with resilient material.

D. Extend the vapor barrier retarder at curbs, walls and wood blocking up to a height equal to the thickness of the insulation.

3.5 INSTALLATION OF ROOF INSULATION

A. Extend full thickness in two or more layers following the manufacturer's approved shop drawings over entire surface to be insulated, cutting and fitting tightly around obstructions.

B. Stagger joints a minimum of 6 inches.

C. Limit joints between adjacent units to 1/8" maximum.

D. Installing Insulation with Mechanical Fasteners at new metal deck: Fasten insulation with mechanical fasteners spaced in conformance with manufacturer's requirements with fully adhered insulation at existing concrete deck.

E. Do not install more insulation each day than can be covered with membrane before end of day or before start of inclement weather. Discard insulation that contains moisture.

D. Taper insulation around drains to provide smooth transition from roof surface to drain clamping ring.

E. Form cant strips, crickets and tapered areas with precut material as shown and as required for proper drainage of membrane.

3.6 INSTALLATION OF COVERBOARD

A. Install coverboard with long lengths perpendicular to insulation board. Allow for 1/8" gap between adjacent sheets.

B. Install only that amount of coverboard that can be covered during one day's operations.

C. Set each board in a full spray application or in ribbons of insulation adhesive. Press each board into the adhesive to provide a firm and uniform attachment.

3.7 INSTALLATION OF SINGLE PLY MEMBRANE

A. General
   1. Install roof membrane in accordance with manufacturer's instructions.

B. Adhering Roofing Membrane to the Substrate

1. Install largest possible sheets to minimize seams and minimize drainage across laps of sheets.
2. Fold sheet in half so that the bottom side of full length by half the width is presented.
3. Apply a 100% continuous coat of Water-based Bonding Adhesive to the area of substrate exposed by folding membrane back. Work evenly across the area to ensure membrane will be rolled into wet adhesive. Reapply adhesive to any areas that have dried or skinned over.
4. Carefully unroll the folded section of membrane and lower it onto the glued substrate surface while adhesive is wet, avoiding any wrinkles or air pockets. Immediately broom the adhered area applying pressure to promote full contact.
5. Repeat the procedure for the other half of the sheet.
6. For roofs with edge drainage, start at the low edge with the first sheet and follow the procedure described in the preceding paragraph.
7. Layout the second sheet with a 2-in. overlap on the edge of the first sheet. Perform lap splice. After splice has cooled, completely expose the bottom side of the second sheet by folding back along the splice. Apply adhesive evenly to substrate surface only, carefully turn membrane back onto glued substrate surface while adhesive is still wet, avoiding any wrinkles or air pockets. Apply only enough adhesive to an area of the substrate to ensure membrane will be rolled into wet adhesive. Broom surface applying pressure to promote full contact. Repeat procedure for each sheet proceeding across roof.
8. At perimeters that are to receive a gravel stop or metal edging, the membrane must be brought over the outside edge and terminated 12-in. o.c. unless otherwise stated in the appropriate detail.
9. Membrane must be mechanically attached 12-in. o.c. at all perimeters with Stevens fasteners and Plates.
10. Lap Splices
    a. Membrane shall be overlapped and hot-air welded without any contaminants (adhesive, dirt, debris, etc.) prevalent in the seam. For areas of membrane that do not have a selvage edge, weld a cover strip of standard non-fleece membrane over butted joint.
    b. The entire lap edge must be probed with approved seam probing tool after it has cooled completely to verify seam consistency. Cut edges shall be caulked by applying Cut-Edge Sealant from a squeeze bottle.
    c. Remove contaminants from the Stevens EP Fleece and Stevens EP membrane prior to welding.
11. Perimeter fastening: Provide wood nailers for perimeter gravel stops or drip edges. Membrane may be fastened at other transitions, e.g. walls and curbs, by use of manufacturer's metal plates and screws fastened 12-in. o.c. into deck.
12. Flashing: Install flashing at perimeters, and other details in conformance with manufacturer's recommended details.

3.8 ROOFING GUARANTEE WARRANTY

A. See the following, Appendix A - DASNY Standard Roofing Warranty.

B. Related Work: Install accessories, mechanical fasteners, flashings and counter flashings at locations indicated and as recommended by manufacturer and Section 076200 - Sheet Metal Flashing and Trim.

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Instructions: The Consultant should include the Appendix A below at the end of the roof membrane specification Section. The Consultant shall be responsible for cross-referencing the appendix in the appropriate paragraphs of the applicable specification sections.

APPENDIX A

WARRANTY AND MAINTENANCE AGREEMENT

TOTAL ROOF SYSTEM WARRANTY

Warranty #: _____ **Square Footage:** _____
DASNY JDE #: _____
Building Name: _____
Facility: _____
Warranty Period: Twenty years Beginning MM/DD/YYYY
Roofing Contractor & Contact: _____
Roofing Contractor Address: _____
Roofing Contractor Telephone – Fax: _____
Roofing Contractor Email Address: _____
Roofing Manufacturer & Contact: _____
Roofing Manufacturer Address: _____
Roofing Manufacturer Telephone – Fax: _____
Roofing Manufacturer Email Address: _____

TERMS, CONDITIONS AND LIMITATIONS

A. Upon completion of the Roofing System and as a condition of its acceptance, deliver to the Owner two (2) copies of the following "Warranty and Maintenance Agreement", signed by the Contractor and the Roofing Manufacturer. This is a total system warranty, covering all roofing components provided by the Contractor or Roofing Manufacturer, including, but not limited to, membrane, fasteners, asphalt, insulation, insulation adhesive, cover board, membrane flashing, metal coping, metal cap flashing and/or gravel stop assemblies.

B. Upon execution of this document, the undersigned Contractor hereby proposes and agrees, for a period of two (2) years after final acceptance of the roof, to make immediate repairs as required to stop leaks or correct defects in the roofing system. Said repairs shall be made within seventy-two (72) hours of the receipt of a notice from the Owner by telephone, fax, email or letter. Subject to provisions established in Paragraph E below, the Contractor further agrees to make such repairs without reference to or consideration of the cause or nature of such leaks or defects. (See Surety Bond section below for additional requirements.)

C. Upon execution of this document, the undersigned Roofing Manufacturer hereby proposes and agrees, for a period of twenty (20) years after final acceptance of the roof, to make immediate repairs as required to stop leaks or correct defects in the roofing system. Said repairs shall be made within seventy-two (72) hours of the receipt of a notice from the Owner by telephone, fax, email or letter. Subject to provisions established in Paragraph E below, the Roofing Manufacturer further agrees to make such repairs without reference to or consideration of the cause or nature of such leaks or defects.

D. Five (5) consecutive annual inspections, commencing one (1) year after acceptance of the work by the Owner, shall be made by the Manufacturer of the roofing system. The Manufacturer shall be responsible for contacting the Owner and scheduling the annual inspections. The Manufacturer shall submit a written report, within ten (10) days of the inspection, to the Owner, which shall include, but not be limited to, any indication of damage, deterioration, unusual wear, weathering effects, or no apparent defects at all. Further, the Manufacturer shall arrange and pay for the immediate repairs needed to stop any potential leaks or correct any defects discovered during the annual inspections, subject to provisions established in Paragraph E below.

E. Repairs required within the stated period will be provided without cost to the Owner, except that repairs required consequent to an Act of God, abuse, alteration, or failure of the substrata or supporting structure (other than caused by defects in the roofing system) will be paid for by the Owner upon completion of the repair in each instance. Any determination on whether the repairs are the Owner's responsibility will be made by an independent third party.

F. Repairs that are the Owner's responsibility to pay shall be invoiced to the Owner at the prevailing wage rates, and shall include an itemized breakdown of quantities plus unit cost for labor and materials, and shall include not more than twenty (20) percent markup for overhead and profit.

G. Unless otherwise specified, the roofing system shall be warranted against failure due to wind speeds up to and including seventy-two (72) miles per hour, regardless of building height, as measured at the closest office of the National Weather Service.

H. This Warranty and Maintenance Agreement, and the enforcement of its provisions, shall not deprive the Owner of any action, right, or remedy otherwise available to them.

SURETY BOND

The Contractor shall, as principal, furnish to the Owner before final payment a surety bond guaranteeing the installation of the total roofing system, including all membrane, fasteners, asphalt, insulation, insulation adhesive, cover board, membrane flashing, metal coping, metal cap flashing and/or gravel stop assemblies installed in connection with same, free from defects as to the materials, workmanship, leaks, and damage as a result of leaking. Guarantee shall be for a period of two (2) years from the date of final acceptance of the roof. Said bond shall be in the amount of fifty (50) percent of the cost of the original bid amount (roof system installation and associated removals) as determined by the Owner from a detailed estimate or other information available.

ROOFING CONTRACTOR
By:

Authorized Signature_____
Title

ROOFING MANUFACTURER
By:

Authorized Signature_____
Title

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
1. Drip edges.
2. Roof edge/fascia/rake.
3. Flashings and counter flashings.
4. Miscellaneous sheet metal accessories.

1.2 QUALITY ASSURANCE

A. Standards - Comply with latest edition of the following:
1. SMACNA, "Architectural Sheet Metal Manual."

1.3 SUBMITTALS

A. Samples
1. 8" square samples of specified sheet materials to be exposed as finished surfaces.
2. 12" long samples of factory and shop fabricated products. Provide with specified factory finish.

B. Shop Drawings: Layout, joining, profiles and anchorage of fabricated work.

C. Product Data: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

D. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
a. Extended Producer Responsibility
b. Bio-Based Materials
c. Wood products certified by FSC or USGBC approved equivalent.
d. Materials Reuse
e. Recycled Content
f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

3. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Coordinate this work with interfacing and adjoining work to sequence each installation properly; ensure best possible weather-resistance and durability of work, plus protection of materials and finishes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. 24 gauge G90 galvanized A50 steel conforming to ASTM E11-61 with smooth texture, unless noted otherwise.
   1. Roof Transition Flashing: 20 gauge G90 galvanized A50 steel conforming to ASTM E11-61 with smooth texture.

B. Finish shall be two coat Kynar 500 Fluoropolymer with strippable vinyl masking, color as selected by Architect from manufacturer's standard colors.

C. Flashing for Storefront Systems and Aluminum Windows: .040" coil coated aluminum. Color to match storefront system framing.

D. Provide all accessories including fascias, flashing, trim, clips, miscellaneous trim, to match color, and finish of roofing panels.

E. Retainer clips: Provide 20 ga retainer cleats.

F. Fasteners
   1. Provide stainless steel fasteners.
   2. Match finish of exposed heads with material being fastened.
   3. Provide neoprene gaskets where fastener is not exposed to view.

G. Metal Accessories
   1. Sheet metal clips, cleats, straps, anchoring devices and similar accessory units for installation of work.
   2. Comply with SMACNA standards; provide size and gauge required for performance.
   3. Noncorrosive; matching or compatible with material being installed.

H. Sealant: Silpruf by General Electric or accepted equal.

2.2 FABRICATED PRODUCTS

A. General
   1. Shop-fabricate work to greatest extent possible.
   2. Fabricate profiles in sections minimum 10 feet long.
   3. Fabricate for waterproof and weather-resistant performance, sufficient to permanently prevent leakage, damage or deterioration of work.
   4. Flashing and sheet metal work shall be brake-formed only. Roll-forming and other fabrication methods not acceptable.

5. Brake-form all sheet metal work without excessive oil-canning, buckling and tool marks; true to line and levels indicated.
6. Hem all exposed edges.
7. Form work to fit substrates.
8. Comply with material manufacturer's instructions and recommendations for forming material.
9. Fabricate corners to provide same degree of waterproofing as straight sections and joints.

B. Roof Edges/Fascias
1. Provide movement joints between sections with 6" cover and 6" backup plates.

C. Horizontal Cleats
1. Provide minimum 2" vertical leg and minimum 1/2" clip leg formed with 30° angle from vertical plane.

D. Aluminum Roof Edge: Anchor-Tite Standard Fascia by Metal-Era or accepted equal.
1. Size: Match adjacent roof edge at metal roof.
2. Cover Material: .040 inch aluminum.
3. Finish: Standard color 30 year Kynar-500 as selected by Architect from the manufacturer's color chart.
4. Fascia: Standard 12'-0" lengths.
5. Trim: Provide factory fabricated mitered corners, scupper and trim extension.
6. Anchor Bar: Continuous extruded aluminum bar with pre-punched slotted holes and fastened with manufacturer's standard stainless steel fasteners. Standard 12'-0" lengths.
7. Warranty: Manufacturer's Standard Warranty and Lifetime 215 mph wind warranty tested per ANSI/SPRI ES-1 Standard.
8. Wind Uplift Protection: Factory Mutual 1-645 approved.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General
1. Comply with manufacturer's installation instructions and recommendations.
2. Comply with details indicated and with SMACNA "Architectural Sheet Metal Manual", except as otherwise indicated.
3. Anchor work securely in place by methods indicated, providing for thermal expansion of metal units.
4. Conceal fasteners where possible and set units true to line and level and indicated.
5. Install laps, joints and seams permanently watertight and weatherproof.
6. Separate metal from noncompatible metal or corrosive substrates by coating concealed contact surfaces with bituminous coating or other permanent separation as manufacturer/fabricator recommends.

7. Metal panels shall be secured with elongated punched holes and fasteners snug tight to allow thermal movement of all sheet metal flashing and trim.

B. Flashings
   1. Cleats
      a. Space sections of continuous cleats 1/4" apart.
      b. Cleat end locations shall not coincide with vertical joints and seams. Provide minimum 6" offset.
      c. Fasten cleats to substrate 3" o.c., staggered.
   2. Roof Edge/Fascias
      a. Fasten horizontal leg to substrate 3" o.c., staggered.
      b. Provide cover/backup plates at joint locations.

C. Joints and Seams
   1. Lap Joints
      a. 4" single lap in direction of water flow.
      b. Seal with sealant in lap; do not expose sealant.
   2. Backup Plate Joints
      a. Fasten 12" long backup plate to substrate.
      b. Set sections of coping, fascia, etc. in sealant, 1/4" apart.
   3. Cover Plate Joints
      a. Fasten 6" long cover plate, centered on gap in main sections; embed in sealant.
   4. Non-moving Seams
      a. Provide flatlock type except where otherwise detailed or indicated by SMACNA.
      b. Seal all exposed edges with sealant.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances able to corrode metal or deteriorate finishes.

B. Protection: Ensure undamaged or undeteriorated work, other than natural weathering, at time of substantial completion.

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SECTION 077200
ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Eave Vents.
   2. Ridge Vents.
   3. Fire Rated Access Hatch.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, details, installation instructions and general product recommendations, including temperature rise performance.

B. Shop Drawings indicating locations, installation drawings (job specific), and details.

C. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   3. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

PART 2 - MATERIALS

2.1 MATERIALS

A. Eave Vent: Model S-400, 1"x1 ½" as manufactured by Coravent, Inc or approved equal.
   1. Net free ventilation area: 10 square inches per foot

2. Color: Black.

B. Ridge vent: Model V-600TE, 1"x3 ¼" as manufactured by Coravent, Inc or approved equal.
   1. Net free ventilation area: 20 square inches per foot
   2. Color: Black.

C. Fire Rated Access Hatch: Type FR-4, 2 hour rated, 3'-0" x 3'-0" with safety post by the Bilco Co. or accepted equal. Provide fully assembled units. Factory finish shall be mill finish aluminum.
   1. Performance Characteristics:
      a. Cover: Reinforced to support a minimum live load of 150 psf (732 kg/m^2) with a maximum deflection of 1/150th of the span.
      b. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
      c. Operation of the cover shall not be affected by temperature.
      d. Door and frame assembly shall be tested in accordance with ASTM E119 and NFPA 251 and UL Listed as having a 2-hour fire rating when exposed to fire from the underside. In the closed position, the temperature on the unexposed surface of the door shall not exceed 325°F (162°C) above ambient for the duration of the 2-hour period. Manufacturer shall submit a test report certifying this performance.
      e. Door shall be equipped with a fusible link activated closing system that will automatically close and latch the door leaf in the event of fire when heat parts the UL Listed 165° (74°C) fusible link.
   2. Cover: 1" (25.4mm) fillable pan to receive concrete.
   3. Frame: Shall be 1/4" (6.3 mm) extruded aluminum with full anchor flange around the perimeter.
   4. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" (6.3 mm) gusset support plate.
   5. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open, and the latch release shall be protected by a flush, gasketed, removable screw plug.
   6. Automatic closing system: Shall be a self-contained, pneumatic, fusible link activated, closing system that will automatically close and latch the door in the event of fire when heat parts the UL Listed 165° (74°C) fusible link.
   7. Hold-open system: Door shall be equipped with a pneumatic hold-open system to automatically hold the door in the open position (90°). A release button for the hold-open system shall be provided and shall reset itself when the cover is closed.
   8. Hardware:
      a. Hinges: Shall be a continuous heavy duty Type 316 stainless steel hinge that is accessible only when the cover is in the open position.
      b. Cover shall be fitted with the required number and size of compression spring operators. Springs shall have an electrocoated acrylic finish.
      c. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover and a cable release handle shall be provided to open the cover from the underside.

d. Hardware: Compression spring tubes shall be an anti-corrosive composite, all fasteners shall be Type 316 stainless steel material, and all other hardware shall be zinc plated and chromate sealed. Springs shall have an electrocoated acrylic finish for corrosion resistance.
e. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.
f. Intumescent seal: Provide intumescent seal as required by manufacturers test data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Coordinate as required with installation of roofing and flashing, all to ensure that each element of the work performs properly and that combined elements are waterproof and weathertight.

B. Anchor units securely to substrates.

3.2 CLEANING AND PROTECTION

A. Clean exposed surfaces in accordance with manufacturer's instructions.

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SECTION 078120
INTUMESCENT FIRE RESISTANT COATING

PART 1 GENERAL

1.1 SCOPE

A. This specification covers labor, materials, equipment, and application necessary for, and incidental to, the complete and proper installation of intumescent fire protection for application to steel structures and supports in accordance with all applicable requirements of contract documents.

B. This specification shall be supplemented by the applicable requirements of building codes, insurance rating organizations and all authorities having jurisdiction.

1.2 SECTION INCLUDES

A. Intumescent fire protection material.

B. Topcoat protective decorative finish.

1.3 REFERENCES

A. Underwriters Laboratories Inc. (UL) Fire Resistance Directory.

B. Underwriters Laboratories of Canada (ULC) - List of Equipment and Materials.

C. Test Standards

1. ASTM E84 - Surface Burning Characteristics of Building Materials.

2. Flame Spread Maximum: 0 and Smoke Developed Maximum: 5. Class A

3. Material manufacturer's current published Product Technical Data Sheet (PDS) and Material Safety Data Sheet (MSDS).

4. AWCI Technical Manual 12-B "Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide", Latest Edition.

1.4 SYSTEM DESCRIPTION

A. The intumescent fire protection materials shall be applied at the required thickness to provide the UL fire resistive ratings.

B. Extrapolated thickness requirements will not be accepted.

1.5 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's Product Data Sheet (s), and certifications as may be required to verify material compliance with contract documents.

B. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.6 QUALITY ASSURANCE

A. Manufacturer - Company specializing in manufacturing fire protection products.

B. The intumescent fire resistive material shall be manufactured under the Follow-Up Service program of UL or ULC and bear the UL and/or ULC label (mark).

C. Product - The product shall be approved by the architect and applicable authorities having jurisdiction. Products shall meet the ASTM E 119 fire standard, be tested at Underwriters Laboratories per UL 263 and meet the requirements of the local authority having jurisdiction.

D. Applicator - A firm with expertise in the installation of fire resistive or similar materials. Applicator must have applied intumescent fireproofing on projects of similar size and scope.

E. Mock-up: A representative mock-up sprayed Architectural finish sample must be submitted, reviewed, and accepted by the architect in advance.

F. LEED Submittal:
   1. Product Data for Credit EQ 4.2: For paints installed inside of the weatherproofing system, including printed statement of VOC content.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data. Packaged materials shall bear the appropriate labels, seals and UL label (mark) for fire resistive ratings and shall be stored

at temperatures between 41° F (5° C) and 77° F (25° C), in a dry interior location away from direct sunlight.

B. DO NOT FREEZE.

1.8 PROJECT/SITE CONDITIONS

A. When the temperature at the job site is less than 50° F (10° C), a minimum substrate and ambient temperature of 50° F (10° C) shall be maintained prior to, during, and a minimum of 72 hours after application. If necessary for job schedule, the General Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels in the application areas.

B. In enclosed areas, ventilation shall not be less than 4 complete air exchanges per hour until the material is dry.

C. Relative humidity shall not exceed 85% throughout the total period of application and drying for the intumescent fire resistive material, and must not exceed 85% throughout the application and drying for the protective decorative topcoat.

1.9 SEQUENCING AND SCHEDULING

A. Applicator shall cooperate in the coordination and scheduling of fire protection work to avoid delays in job progress.

B. The installation of piping, ducts, conduit or other suspended equipment shall not commence until the application of the thin-film fire resistive material is complete in that area.

PART 2 - PRODUCTS

2.1 COMPATIBLE METAL PRIMER

A. Primer shall be approved by manufacturer and applied in full accordance with the primer manufacturer's written instructions.

2.2 INTUMESCENT FIRE PROTECTION SYSTEM

A. Intumescent fire resistive coating: Albi Cote FRL by Albi Manufacturing.
   1. Water-Based Formulation: Approved by manufacturer and authorities having jurisdiction for indicated use.
   2. Verify with manufacturer that products selected are suitable for use indicated.
   3. UL Fire Tested Designs Only based on UL(ASTM-84).

B. Intumescent fire resistive primer: Albi 490W by Albi Manufacturing.

C. Thin-Film Fire-Resistive Intumescent Mastic Coating: Factory-mixed formulation.

2.3 TOPCOATING

A. Topcoat materials shall be as required for color-coding, aesthetics or additional surface protection, approved by the thin-film fire resistive material manufacturer and applied in full accordance with the coating manufacturer's written instructions.

PART 3 - EXECUTION

3.1 PREPARATION

A. All surfaces to receive Intumescent fire resistive coating shall be clean, dry and free of oil, grease, loose mill scale, dirt, dust or other materials which would impair bond of the thin-film fire resistive material to the surface.

B. Confirm compatibility of surfaces to receive Intumescent fire resistive coating.

C. Provide masking, drop cloths or other suitable coverings to prevent overspray onto surfaces not intended to be coated with intumescent coating.

3.2 APPLICATION

A. The intumescent fire resistive coating shall be applied at the required dry film thickness per the appropriate UL design number guidelines and manufacturers written application instructions. Testing over carbon reinforced fiber anticipates 80 s.f. per gallon of coating.

3.3 MOCK UP

A. Before proceeding with the work, the applicator shall apply the thin-film fire resistive material to a section witnessed by the architect's or owner's representative. The application shall be subject to their approval and shall be used as a guide for texture and thickness of the finished work.

3.4 CLEAN UP AND REPAIR

A. Upon completion of installation, all excess material, overspray and debris shall be cleared and removed from the job site.

B. Patching and Touch-Up shall be performed by an applicator with expertise in the installation of Intumescent Fire Protection Coatings. Repair shall be in accordance with UL design number guidelines and manufacturers written application instructions.

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SECTION 078400
FIRESTOPPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire resistance rated construction by maintaining an effective barrier against the spread of flame, smoke and/or hot gases through penetrations, fire resistive joints, and perimeter openings in accordance with the requirements of the Building Code for this project.

B. Firestop systems shall be used in locations including, but not limited to, the following:
   1. Penetrations through fire resistance rated wall assemblies including both empty openings and openings containing penetrants.
   2. Membrane penetrations in fire resistance rated wall assemblies where items penetrate one side of the barrier.

C. Related Sections include, but are not limited to, the following:
   1. Division 21 – Fire Suppression
   2. Division 22 – Plumbing
   3. Division 23 – Heating, Ventilating and Air Conditioning
   4. Division 26 – Electrical
   5. Division 27 – Communications
   6. Division 28 – Electrical Safety and Security

1.3 REFERENCES

A. New York State Uniform Fire Prevention and Building Code.

B. National Fire Protection Association (NFPA)
   1. NFPA 101 (Life Safety Code)

C. American Society For Testing and Materials Standards (ASTM):
   1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E814: Standard Test Method for Fire Tests of Through-Penetration Firestops.
   3. ASTM E1966: Test Method for Resistance of Building Joint Systems.
   4. ASTM E1399: Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Width.
   5. ASTM E119: Methods of Fire Tests of Building Construction and Materials.
   6. ASTM E2174: Standard Practice for On-Site Inspection of Installed Fire Stops
   7. ASTM E2307: Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA)
   8. ASTM E2393-04 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

D. Underwriters Laboratories Inc. (UL):
   1. UL Qualified Firestop Contractor Program.
   2. UL 263: Fire Tests of Building Construction and Materials.
   3. UL 723: Surface Burning Characteristics of Building Materials.
   4. UL 1479: Fire Tests of Through-Penetration Fire Stops.
   5. UL 2079: Tests for Fire Resistance of Building Joint Systems.

E. UL Fire Resistance Directory -Volume 2:
   1. Through-Penetration Firestop Devices (XHJI)
   2. Fire Resistive Ratings (BXUV)
   3. Through-Penetration Firestop Systems (XHEZ)
   4. Fill, Void, or Cavity Material (XHHW)

F. Omega Point Laboratories (OPL)
   1. Building Products, Materials & Assemblies – Volume II

G. Factory Mutual Research (FM):
   1. FM 4991: FM Approval Standard of Firestop Contractors – Class 4991

1.4 DEFINITIONS

A. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.

B. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s).

C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.

D. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.

E. Membrane-penetration: Any penetration in a fire-rated wall or floor/roof-ceiling assembly that breaches only one side of the barrier.

F. Fire Resistive/Construction Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.

G. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and an exterior wall assembly.

H. Approved Testing Agencies: Not limited to: Underwriters Laboratory (UL), Factory Mutual (FM), Warnock Hersey, and Omega Point Laboratory (OPL).

1.5 PERFORMANCE REQUIREMENTS

A. Penetrations: Provide through-penetration and membrane-penetration firestop systems that are produced and installed to resist the spread of fire, passage of smoke and other

hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.

1. Provide and install complete penetration firestopping systems that have been tested and approved by nationally accepted testing agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.
2. F-Rated Systems: Provide firestop systems with F-ratings indicated, as determined per ASTM E814 or UL 1479, but not less than one (1) hour or the fire resistance rating of the assembly being penetrated.
3. T-Rated Systems: Provide firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E814 or UL 1479, where required by the Building Code.
4. For penetrations involving non-metallic, CPVC, PVC, or plastic piping, tubing or conduit, provide firestop systems that are chemically compatible in accordance with Manufacturer requirements.

B. Fire Resistive Joints: Provide joint systems with fire resistance assembly ratings indicated, as determined by UL 2079 (ASTM E1399 and E1966), but not less than the fire resistance assembly rating of the construction in which the joint occurs. Firestopping assemblies must be capable of withstanding anticipated movements for the installed field conditions.

1. For firestopping assemblies exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
2. For floor penetrations exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means, as specified by the Architect.
3. L- Rated Systems: Provide firestop systems with L- ratings less than 5cfm/sf.

C. Firestopping products shall have flame spread ratings less than 25 and smoke-developed ratings less than 450, as determined per ASTM E 84. Note: Firestop products installed in plenum spaces shall have a smoke developed rating less than 50.

D. Engineering Judgment (EJ): Where there is no specific third party tested and classified firestop system available for an installed condition, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the Approving Authority, Design Professional and Authority Having Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines.

1.6 SUBMITTALS

A. Product Data: For each type of firestopping product selected. Manufacturer's certification must verify that firestopping materials are free of asbestos, lead and contain volatile organic compounds (VOCs) within limits of the local jurisdiction.

B. Design Listings: Submit system design listings, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestop configuration.

C. Installation Instructions: Submit the manufacturer's installation instruction for each firestop assembly.

D. Where there is no specific third party tested and classified firestop system available for a particular configuration, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) for submittal.

E. Material Safety Data Sheet (MSDS): Submit for each type of firestopping product selected.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Submit documents as per 1.7.

G. A quality control manual approved by FM or UL (if applicable).

H. Firestop Schedule: Submit schedule (see appendix A) itemizing the following:
   1. Manufacturer's product reference numbers and/or drawing numbers.
   2. Listing agency's design number.
   3. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.
   4. Maximum allowable annular space or maximum size opening.
   5. Wall type construction.
   6. Floor type construction.
   7. Hourly Fire resistance rating of wall or floor.
   8. F rating.
   9. T, L, and W rating, if applicable.

I. Firestop Application Log: A separate binder shall be prepared and kept on site for use by the Inspection Agency and the Authority Having Jurisdiction. The binder shall contain the following:
   1. The binder shall be a three (3) ring binder.
   2. Firestop Schedule (see appendix A)
   3. All approved firestopping assemblies including engineering judgments shall be provided and organized by trade.
   4. Copy of manufacturer's installation instruction for each firestop assembly.
   5. A matrix or table of contents listing each assembly shall be provided.
   6. The binder shall be updated as new firestop assemblies or EJ's are added.
   7. The binder shall be kept on-site at a location approved by the Owner.

1.7 QUALITY ASSURANCE

A. Provide firestopping system design listings from UL, FM, Warnock Hersey or OPL in accordance with the appropriate ASTM Standard(s) per article 1.5.

B. Contractor Qualifications: An acceptable Firestop Contractor shall be:
   1. Licensed by State or Local Authority where applicable, or
   2. FM Research approved in accordance with FM Standard 4991, or
   3. UL Qualified Firestop Contractor, or
   4. Meet the following requirements:
      a. Installation personnel shall be trained by the approved firestop manufacturer.
      b. The installation firm shall be experienced in installing firestop systems and fire resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
      c. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified tested and listed system requirements.

d. Minimum of three (3) years experience and shown to have successfully completed not less than 5 comparable scale projects and provide references.

C. Single Source Limitations: Obtain firestop systems for all conditions from a single manufacturer.

D. Materials from different firestop manufacturers shall not be installed in the same firestop system or opening.

E. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.

F. Firestopping sealants must be flexible, allowing for normal movement.

G. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces such that a void is created.

H. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.

I. Materials used shall be in accordance with the manufacturer's written installation instructions.

J. Identify installed firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and provide a label material that will result in partial destruction of label if removal is attempted. Include the following information on labels:
   1. The words "Warning - Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Firestop system designation of applicable testing and listing agency.
   4. Date of installation.
   5. Firestop system manufacturer's name.
   6. Installer's name.

K. Inspection of penetrations through fire rated floor and wall assemblies shall be in accordance with ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops and ASTM E2393-04 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers. The Owner may engage a qualified, independent inspection agency, or material testing agency to perform these inspections.

L. Field Mock-up Installations: Prior to installing firestopping, erect mock-up installations for each type firestop system indicated in the Firestop Schedule to verify selections made and to establish standard of quality and performance by which the firestopping work will be judged by the Owner or Owner's Representative. Obtain acceptance of mock-up installations by the Owner or Owner's Representative before start of firestopping installation. Provide at least 72 hours notice to Owner or Owner's Representative prior to inspection.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture/expiration, lot number, listing agency's classification marking, and mixing instructions for multi-component materials.

B. Store and handle materials per manufacturer's instructions to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. All firestop materials shall be installed prior to expiration date.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Install firestopping when ambient or substrate temperatures are within limits permitted by the manufacturer's written instructions. Do not install firestopping when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate per the manufacturers written instructions on the product's Material Safety Data Sheet.

C. Verify the condition of the substrates before starting work.

D. Care should be taken to ensure that firestopping materials are installed so as not to contaminate adjacent surfaces.

1.10 COORDINATION

A. Coordinate areas prior to firestopping installation with the Owner, Construction Manager and/or all other Contractors.

B. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed according to specified requirements. Opening shall not exceed maximum restrictions allowable for annular spacing per listing or acceptable Engineering Judgments.

C. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

D. Do not conceal firestopping installations until the Owner's inspection agency or Authorities Having Jurisdiction have examined each installation.

E. Schedule firestopping after installation of penetrants and joints but prior to concealing or obstructing access to areas requiring firestopping.

F. Preinstallation Conference: This conference should be a joint meeting attended by the Owner's Representative and all prime contractors, respective firestopping sub-contractors and firestopping company field advisor to review project requirements. The agenda for the conference should include the following topics:
   1. Review scope of work.
   2. Review shop drawings and firestop application log.

3. Review mock-up requirements.
4. Discuss identification labels and locations.
5. Review schedule, coordination and sequencing with all trades.
6. Review any engineering judgments or other special requirements.
7. Function and frequency of inspections and testing labs.

G. Destructive testing shall be performed at mock up and at pre-determined intervals according to ASTM E 2174 and ASTM E 2393-04 by the inspector and with the installing Contractor present. Inspector to test for in place installation conformance to tested and listed system or engineering judgment details. Non-conformances will result in additional destructive testing, at the cost of the installer.

PART 2 – PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Curtainwall Fire Containment System: Thermafiber Impasse System by Thermafiber Inc. or accepted equal consisting of the following elements:
1. Safing Insulation: SAF Safing Insulation, 6.0 psf, R=4.2, with vapor retarding foil facing, 4" thickness.
2. Smoke Sealant: Smoke Seal Compound as recommended by the manufacturer.
3. Accessories: Metal backer angle, horizontal and vertical hangers, locking washers, spiral anchors, impaling pins and z clips as required by the manufacturer.
4. Fire Resistance Ratings: The material shall have been tested and reported by Underwriters Laboratories, Inc., or another accredited laboratory and shall be listed in the Underwriters Laboratories Fire Resistance Directory or the directory of another accredited testing laboratory.

B. Firestopping products specified in system design listings by approved testing agencies may be used providing they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate assembly.

C. Manufacturer of firestopping products shall have been successfully producing and supplying these products for a period of not less than three years and be able to show evidence of at least ten projects where similar products have been installed and accepted.

D. Accessories: Provide components for each firestop system that is needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by the firestopping manufacturer and by the approved testing agencies for the firestop systems indicated. Accessories include, but are not limited to the following items:
1. Permanent forming/damming/backing materials, including the following:
   i. Slag wool fiber insulation.
   ii. Foams or sealants used to prevent leakage of fill materials in liquid state.
2. Temporary forming materials.
3. Substrate primers.
4. Steel sleeves.

E. All firestopping products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed.

2.2 MIXING

A. For those products requiring mixing before application, comply with firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.3 MANUFACTURERS

A. Subject to compliance with the requirements, provide products by one of the following or equivalent manufacturers:
   1. Grace Construction Products.
   2. Nelson Firestop Products.
   3. Hilti Firestop Products.
   4. A/D Fire Protection Systems Inc.
   5. RectorSeal Corporation (The).
   6. Specified Technologies Inc.
   7. 3M; Fire Protection Products Division.
   8. Tremco; Sealant/Weatherproofing Division.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that all pipes, conduits, cables, and/or other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with written recommendations of firestopping manufacturer and the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

3.3 FIRESTOP SYSTEMS INSTALLATION

A. General: Install firestop systems to comply with "Performance Requirements" article in Part 1 and firestopping manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Installation of firestopping shall be performed by an applicator/installer qualified as described in article 1.7.

C. Apply firestopping in accordance with approved testing agencies listed system designs or manufacturer's EJ per the manufacturer's installation instructions.

D. Verify that environmental conditions are safe and suitable for installation of firestop products.

E. Install forming/damming/backing materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire resistance ratings required.

F. Install joint forming/damming materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths of installed firestopping material relative to joint widths that allow optimum movement capability and achieve fire resistance ratings required.

G. Install mechanical attachments, safing materials and firestop materials as applicable within the system design.

H. Install fill materials for firestop systems by proven techniques to produce the following results:
   1. Fill voids, joints and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they fully contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
   4. Tool non-sag firestop materials after their application and prior to the time skinning begins. Use tooling agents approved by the firestopping manufacturer.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Authorities Having Jurisdiction, the Owner, or Owner's Representative shall be allowed to perform random destructive testing during inspection of firestop systems to verify compliance per listings or manufacturer's installation instructions. All areas of work must be accessible until inspection by the applicable Authorities Having Jurisdiction and inspection agencies. The contractor shall be responsible to repair all tested assemblies with no cost to the owner.

B. Proceed with enclosing firestop systems with other construction only after inspections are complete.

C. Where deficiencies are found, repair or replace firestop systems so they comply with requirements.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings, as Work progresses by methods and with cleaning materials that are approved in writing by firestopping manufacturer(s) and that do not damage materials in which openings occur. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

B. Provide final protection and maintain conditions during and after installation that ensure firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce firestop systems complying with specified requirements.

FIRESTOP SCHEDULE

Project No:	Contractor Name and Address:	Date Submitted:
Project Title:	Supplier/Installer Name and Address:	Company Field Advisor Name and Address:
	Manufacturer Name and Address:	

Manufacturer's Product Reference Numbers and/or Drawing Numbers	U.L., FM, Warnock Hersey or Omega Point Lab Penetration Design Nos.	Penetrating Item: Material, Size, Insulated, Combustible, Joint, Perimeter, etc. Description:	Maximum Allowable Annular Space or Maximum Size Opening	Wall type Construction		Floor Type Construction	Fire Resistance Rating of Wall or Floor (Hourly)	F Rating	T Rating (floors Only)	L Rating (if available)	W Rating (if available)
				DES.	CONST.						

SECTION 079200
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Sealant for interior and exterior building joints.
   2. Concrete slab joint sealant.

1.2 QUALITY ASSURANCE

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Installer Qualifications: Engage an experienced Installer with five (5) years of continuous joint sealant installation experience who has completed joint sealant applications similar in material, design and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

C. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.3 SUBMITTALS

A. Product Data
   1. Manufacturer's product specifications and performance-tested data sheets.
   2. Certificates from manufacturers of joint sealants attesting that their products comply with ASTM C970, specification requirements and are suitable for the use indicated. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
   3. Manufacturer's handling/installation/curing instructions.

B. Samples: Samples of manufacturer's standard colors for each type of joint sealer exposed to view.

C. Field-Constructed Mock-Ups: Prior to installation of joint sealants, apply elastomeric sealants to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Joints in field-constructed mock-ups are to represent typical assemblies specified in other Sections that are to receive elastomeric joint sealants specified in this Section.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:

a. Extended Producer Responsibility
b. Bio-Based Materials
c. Wood products certified by FSC or USGBC approved equivalent.
d. Materials Reuse
e. Recycled Content
f. USGBC approved program meeting leadership extraction criteria.

3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Weather Conditions: Install sealants only under favorable weather conditions; install sealants when temperature is in temperature range recommended by manufacturer for installation.

B. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use and curing time.

C. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants or other causes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sealant: Sonolastic NP 2 by Sonneborn or accepted equal. Two component polyurethane sealant complying with ASTM C920; Type P, Grade NS, Class 25 and Use NT.

B. Silicone Sealant: Silpruf 2000 by General Electric or accepted equal. Single component silicone sealant complying with ASTM C920; Type S, Grade NS, Class 25 and Use NT.

C. Mold-Resistant Sealant: Sanitory SCS1700 by General Electric or accepted equal. Single component silicone complying with ASTM C 190; Type S; Grade NS, Class 25, and Use NT.

D. Concrete Slab Joint Sealant: MasterSeal SL2 sealant by BASF or accepted equal. Multi-component polyurethane sealant complying with ASTM C920; Type M, Grade P, Class 25 and Use T.

E. Joint Primer/Sealer: As recommended by sealant manufacturer for joint surfaces to be primed or sealed.

F. Backer Rod: Sonofoam closed cell polyethylene backer rod joint filler by Sonneborn or accepted equal.

G. Cleaning Solvents: Oil free solvents as recommended by the sealant manufacturer. Do not use re-claimed solvents.

H. Masking Tape: Removable paper or fiber tape, self-adhesive, non-staining.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which work is to be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 JOINT PREPARATION

A. Clean joint surfaces immediately before installing joint sealers. Remove dirt, insecure coatings, moisture and other substrates which could interfere with bond of joint sealer.

B. Prepare, prime or seal joint surfaces where recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 JOINT SEALANT INSTALLATION

A. Comply with manufacturer's printed instructions except where more stringent requirements are specified or indicated and with the recommendations of ASTM C962 as applicable to materials, applications and conditions indicated.

B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of backer rods. Do not leave voids or gaps between ends of joint filler units.

C. Install sealant backer rod for sealants, except where shown to be omitted or as sealant manufacturer recommends to be omitted for application indicated.

D. Install sealant to depths as indicated or as recommended by sealant manufacturer.

E. Deposit sealants in uniform, continuous ribbons without gaps or air pockets, solidly against the backing and with complete "wetting" of joint bond surfaces equally on opposite sides.

F. Tooling: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform, concave beads, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

G. Confine sealants or compounds to joints, not spilling onto adjoining work or migrating into voids of exposed finished surfaces; clean adjoining surfaces by whatever means necessary to eliminate evidence of spillage.

H. Use mold-resistant sealant in all bathrooms and shower rooms.

3.4 CURING AND PROTECTION

A. Comply with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

B. Cure and protect joint sealers.

C. Replace or restore sealants which are damaged or deteriorated during construction period.

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SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
   1. Hollow metal frames.
   2. Hollow metal doors.

1.2 QUALITY ASSURANCE

A. Comply with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (ANSI/SDI A250.8) and as herein specified.

B. Fire Rated Door Assemblies: Provide fire rated units that have been tested as fire door assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to NFPA 252, UL 10C or UL 1784.
   1. Side Hinged Doors: Test and pass the requirements of NFPA 252 with the neutral pressure level established at 40 inches or less above the sill.
   2. Vertical Exit Enclosures and Exit Passageway Doors: Doors shall have a maximum transmitted temperature end point of not more than 450°F above ambient after 30 minutes of standard fire-test exposure per NFPA 252.
   3. Corridor and Smoke Barrier Doors: Test and pass the requirements of NFPA 252 or UL10C without the hose stream test.
   4. Smoke and Draft Control Doors: Test and pass the requirements of UL1784 with installation in accordance with NFPA 105.

C. Fire-Rated Window Assemblies: Provide borrowed light assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency for fire-protection ratings indicated, based on testing according to NFPA 257 under positive pressure.

D. Fire Door Labeling: Identify each door and frame with metal labels indicating the applicable fire class of the unit. Rivet or weld labels on the hinge edge of door and jamb rabbet of frame unless this location is obscured by finished hardware. Labels shall conform to NFPA 80. Smoke and draft control doors shall be labeled indicating compliance.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.

B. Shop Drawings: Include details for each frame type, related adjacent construction, location and installation requirements of finish hardware and reinforcements and details of joints and connection; show anchorage and accessory items.
   1. Provide schedule of frames using same reference numbers for details and openings as those on Contract Drawings.
   2. Coordinate glazing frames and stops with glass and glazing requirements.

C. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   3. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Deliver doors and frames in heavy paper cartons or other protective packaging.

B. Store doors and frames on raised platforms in vertical position with blocking between units to allow air circulation.

PART 2 PRODUCTS

2.1 MATERIALS

A. Hollow Metal Frames: Series "C" by CECO or accepted equal.
   1. Interior frames shall be fabricated from 16 gauge smooth galvannealed (A-40) sheet steel complying with ASTM A366 and ASTM A568.
   2. Exterior frames, bathroom, housekeeping rooms, frames grouted into masonry construction, and other frames indicated to be galvanized, shall be fabricated from 16 gauge smooth zinc coated carbon sheet steel complying with ASTM A526 and hot dipped galvanized in accordance with ASTM A525 with G90 coating designation, mill phosphatized.
   3. Provide continuously, fully welded frame, full profile, with welds ground smooth. Knock-down type frames will not be accepted.
      a. Fixed Stops: Integral 5/8" stop located on corridor side of frame unless otherwise indicated.
      b. Removable Beads: Removable steel beads secured with machine screws located on room side of frame unless otherwise indicated. Form corners with butted hairline joints.
      c. Prepare door frames for silencers as required.
   4. Furnish closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by continuous butt welding.

Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.

5. Wall anchors shall be formed of not less than 16 gauge steel and galvanized if used with galvanized frames.
   a. Masonry Construction: Adjustable, yoke and strap type or masonry T type to suit frame size with leg not less than 2" wide by 10" long. Furnish at least three anchors per jamb up to 7'-2" jamb height; four anchors per jamb to 8' jamb height; one additional anchor per jamb for each 24" or fraction thereof over 8' high.
   b. Steel Stud Construction: Weld-in metal channel stud type welded to back of frame unless otherwise indicated or approved. Furnish at least four anchors per jamb up to 7'-6" jamb height; five anchors per jamb to 8' jamb height; one additional anchor per jamb for each 24" or fraction thereof over 8' high.
6. Provide floor anchor for each jamb and mullion which extends to floor, formed of not less than 16 gauge steel, with two holes to receive fasteners, welded to bottom of jamb or mullion and galvanized if used with galvanized frames.
7. Provide two anchors at head of frames exceeding 42" wide for frames mounted in steel stud walls. Frame manufacturer's standard head anchor unless otherwise indicated.
8. Provide structural reinforcing members, as a part of frame assembly, where required. Provide 12 gauge continuous channel reinforcement in heads for all openings exceeding 48" for frames in masonry walls.
9. Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.
10. Provide 26 gauge steel mortar or plaster guards, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation.
11. Fire rated frames shall bear the appropriate testing agency label.
12. Provide Series **BQW** and **SQW** frames with built-in compression type fire rated gasket seals on all smoke and corridor door frames.
13. Provide Sakrete sand mix in frames at all masonry partitions.

B. Flush Hollow Metal Doors: 1-3/4" thick full flush doors Medallion by CECO or accepted equal.
   1. Interior doors shall be fabricated from 16 gauge smooth galvannealed (A-40) carbon steel sheets complying with ASTM A366 and ASTM A568.
   2. Exterior doors, and other doors indicated as galvanized, shall be fabricated from 14 gauge smooth hot dipped galvanized steel sheets complying with ASTM A924 and ASTM A653 with G90 coating designation.
   3. Interior doors shall be reinforced with 22 gauge hat shaped stiffeners running the full height of the door 6" o.c. and spot welded at 5" o.c. The spaces between stiffeners shall be filled with insulation.
   3. Exterior doors shall be provided with welded and sealed flush steel top cap channels and shall have an insulating polyurethane core producing a U factor of 0.615, and shall have 2-1/2" weep holes in bottom closure concealed from visible door surfaces.
   4. Provide seamless faces joined at vertical edges. Vertical edges to be continuously welded seamless.
   5. Provide 16 gauge top and bottom channels, 7 gauge hinge reinforcement and 12 gauge closer reinforcement and standard lock preparation.
   6. Provide Slim Trim low profile applied steel trim with screw on steel bead to accept glass lite where shown.
   7. Fire rated doors shall bear the appropriate testing agency label.

8. Provide where indicated factory glazing complying with NFPA 80 and NFPA 257 and positive pressure and smoke seal test NFPA252 and UL1784.

C. Hollow Metal Panels: Fabricate interior panels as specified for interior doors and fabricate exterior panels as specified for exterior doors. Thickness to be as noted on drawings.

D. Anchors: Galvanized sheet steel, at least 16 gauge.

E. Inserts, Bolts and Fasteners: Manufacturer's standard units, hot-dip galvanized, complying with ASTM A153.

2.2 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from warp, buckle and other defects. Accurately form metal to required size and profiles. Weld exposed joints and make smooth, flush and invisible by filling or grinding and dressing. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify items that cannot be permanent factory-assembled before shipment, to assure proper assembly at the project site.

B. Exposed Fasteners: Countersunk flat tamper-resistant head for exposed screws and bolts. Unless otherwise indicated, locate fasteners 2" from each end of members and not more than 12" apart.

C. Finish Hardware Preparation:
1. Prepare doors and frames to receive mortised and concealed finish hardware including cutouts, reinforcing, drilling and tapping in accordance with ANSI/SDI A250.6 “Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames” and the Finish Hardware Schedule and templates furnished by hardware manufacturer.
2. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for this hardware may be done at the project site.
3. Locate finish hardware as specified elsewhere or as shown on the hardware manufacturer's templates.
4. Weld 14 gauge steel tongues, 1-1/2" high, inside lock mortise to keep lock body centered in door.
5. Install 7 gauge reinforcement for hinges and pivots. Comply with ANSI/SDI A250.6 for reinforcement for all other hardware.
6. Reinforce doors not mortised for concealed door closers, for surface door closer application and all frames for closer arm application, whether or not closers are specified.
7. Provide frames with three silencers per strike jamb.

D. Clearances: Fabricate doors for their respective frames in accordance with ANSI/SDI A250.8 and as follows.
1. Bottom: 3/8" maximum except where undercut is noted.
2. Fire Rated Doors: Comply with clearances specified in NFPA Standard No. 80.
3. Field verify existing floor tolerance prior to manufacturing doors to determine undercut requirements.

E. Shop Painting
1. Chemically wash, rinse and dry exposed and concealed surfaces of fabricated units.

2. Apply one coat of primer to all surfaces and oven-bake units to achieve a minimum dry film thickness of 1.25 mils. The finish shall meet the requirements for acceptance stated in ANSI/SDI A250.10 “Test Procedures and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames”.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which the work is to be installed. Do not proceed until all unsatisfactory conditions are corrected.

B. Verify floor level tolerance and adjust rated frames to comply with NFPA80.

3.2 INSTALLATION

A. Install steel doors, frames and accessories in accordance with the manufacturer's printed instructions, except as otherwise indicated.

B. Frame Installation: Place frames accurately in position in compliance with ANSI/SDI A250.11 "Recommended Erection Instructions for Steel Frames" unless otherwise indicated.
   1. Except for frames located at existing concrete, masonry installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. Temporary wood spreaders shall be used during the installation of frames. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
   2. In masonry construction, locate wall anchors at jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.
   3. At existing concrete or masonry construction, provide anchors at maximum of 24” on center on hinge jamb and at corresponding heights on strike jamb, set frames and secure to adjacent construction with bolts and masonry anchorage devices.
   4. In metal stud partitions, install wall anchors at jamb at hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
   5. Place fire rated frames in accordance with NFPA 80.
   6. Make necessary field splices in frames as detailed on final Shop Drawings, welded and finished to match factory fabrication.
   7. Grout all frames in masonry construction solidly with mortar.

C. Door Installation
   1. Install doors accurately in their respective frames within the clearances specified in ANSI/SDI A250.8.
   2. Install fire rated doors with clearances as specified in NFPA 80.
   3. Install smoke control doors in accordance with NFPA 105.

D. Drill doors and frames to receive surface applied hardware. All surface applied hardware will utilize sex bolt mounting.

3.3 ADJUSTING

A. Prime Coat Touch-up: Immediately after installation, sand smooth and clean rusted and damaged areas of shop prime coat and apply touch-up of compatible air drying primer.

B. Final Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition.

3.4 CLEANING

A. Clean doors, frames and accessories free of dirt and other foreign materials after completion of installation.

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SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Flush wood doors with veneer faces.

1.2 QUALITY ASSURANCE

A. Standards: Comply with the latest edition of the following:
   1. WDMA I.S.1A, "Architectural Wood Flush Doors Standards."
   2. AWI, "Architectural Woodwork Standards" (AWS) for grade of door, core construction, finish and other requirements exceeding those of WDMA quality standards.

B. Fire Rated Door Assemblies: Provide fire rated units that have been tested as fire door assemblies complying with NFPA 80 "Standard for Fire Doors and Fire Windows" that are listed an labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing according to NFPA 252, UL 10C or UL 1784.
   1. Side Hinged Doors: Test and pass the requirements of NFPA 252 with the neutral pressure level established at 40 inches or less above the sill.
   2. Vertical Exit Enclosures and Exit Passageway Doors: Doors shall have a maximum transmitted temperature end point of not more than 450°F above ambient after 30 minutes of standard fire-test exposure per NFPA 252.
   3. Corridor and Smoke Barrier Doors: Test and pass the requirements of UL10C without the hose stream test.
   4. Smoke and Draft Control Doors: Test and pass the requirements of NFPA252 or UL 1784 with installation in accordance with NFPA 105.

C. Fire Door Labeling: Identify each door with metal labels indicating the applicable fire class of the unit. Rivet or weld labels on the hinge edge of door and jamb rabbet of frame unless this location is obscured by finished hardware. Labels shall conform to NFPA 80. Smoke and draft control doors shall be labeled indicating compliance.

D. Forest Certification: Provide rough carpentry produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC's "Principles and Criteria for Forest Stewardship."

E. Comply with LEED requirements regarding chain of custody certification for fabricators.

F. Do not use any adhesives containing urea formaldehyde.

G. Identify each door with metal UL or Warnock Hersey labels indicating the applicable fire class of the unit. Rivet or weld labels on the hinge edge of door and jamb rabbet of frame unless this location is obscured by finished hardware. Confirm alternative label location with Architect.

1.3 SUBMITTALS

A. Product Data: Submit door manufacturer's data, specifications and installation instructions for each type of wood door.

B. Shop Drawings: Indicate location and size of each door elevation, each kind of door, details of construction, location and extent of hardware blocking, fire ratings, trim for openings, requirements for factory finishing and other pertinent data.

C. Samples: Provide 1'-0" square corner samples for flush doors representing door face and edge to be used with typical range of color and grain. Include shop finish samples for factory finished doors.

D. Warranty: Submit manufacturer's standard written warranty.

E. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the requirements of the referenced standards and with manufacturer's instructions:
   1. Package doors at factory prior to shipping.
   2. Retain package covering until installation.
   3. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames and hardware, using temporary, removable or concealed markings.

B. Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during

remainder of construction period to comply with referenced standards.

1.5 WARRANTY

A. Specific Product Warranty: Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or whose face veneers show telegraphing of the door construction, delamination or do not conform to tolerance limitations of WDMA and AWI. Warranty shall be in effect during following period of time after date of Substantial Completion.
   1. Solid-Core Flush Interior Doors: Life of original installation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Interior Flush Wood Door (Solid Core): Signature Series EPC by Marshfield/Algoma Door Systems or accepted equal.
   1. Thickness: 1-3/4".
   2. Face: 5-ply veneer faces, Select White Hard Maple, Rift Cut book matched premium grade. Provide continuous veneer sequence on paired doors.
   3. Crossband: Nominal 1/16" thick.
   4. Stiles: 2-ply, 1-1/2" laminated, stiles to match face veneer.
   5. Rails: 1-1/8" hardwood.
   6. Adhesive: Per WDMA TM-6.
   7. Core: Heavy duty particleboard complying with ANSI A208.1LD2.
   8. Factory Fitting/Machining: Yes.
   9. Factory Finish: WDMA I.S.1A TR/OP-6 Catalyzed Polyurethane.
      a. Sheen: Satin-medium rubbed effect.
      b. Stain Color: To be selected by Architect.
      c. Open Grained Wood: Filled finish.
   10. Vision Panel Frames: Flush veneer clad lite bead for field glazing.
      a. Species and finish to match wood door.

B. Interior Flush Wood Door (Fire Rated Mineral Core): Signature Series EDFMUF by Marshfield/Algoma Door Systems or accepted equal.
   1. Thickness: 1-3/4".
   2. Face: 5-ply veneer faces, Select White Hard Maple, Rift cut book matched premium grade. Provide continuous veneer sequence on paired doors.
   3. Crossband: Nominal 1/16" thick.
   4. Stiles: 2-ply, 1 ½" high density laminated, stiles to match face veneer.
   5. Rails: 1/2" at top, 1-1/2" at bottom.
   6. Adhesive: Per WDMA TM-6.
   7. Core: Incombustible mineral core with top, bottom and intermediate inner wood blocking as follows:
      a. Top Rail: 5" x full width of door.
      b. Bottom Rail: 5" x full width of door.
      c. Lock and Hinge Blocks: 5" x 10".
      d. Panic Bar Blocking: 5" x full width of door.
   8. Factory Fitting/Machining: Yes.
   9. Factory Finish: WDMA I.S. 1A TR/OP-6 Catalyzed Polyurethane.
      a. Sheen: Satin-medium rubbed effect.

b. Stain Color: To be selected by Architect.
c. Open Grained Wood: Filled finish.

10. Fire Rating: Provide fire rating as indicated on drawings.
11. Vision Panel Frames: Fire rated flush veneer clad lite bead with Metacaulk 950 sealant and metal clips for field glazing.
    a. Species and finish to match wood door.
12. Fire Rating: Provide fire rating as indicated on drawings.
13. Vision Panel Frames: Fire rated flush veneer clad lite bead with Metacaulk 950 sealant and metal clips for field glazing.
    a. Species and finish to match wood door.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which work shall be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Condition doors to average prevailing humidity in installation area prior to hanging.

B. Hardware: Prepare doors to receive scheduled hardware. Coordinate with finished hardware schedule in Section 08710, Finish Hardware, with door frame shop drawings and hardware templates to insure proper fit and alignment of doors and hardware.

C. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and referenced Standards.
   1. Fire Rated Doors: Install in corresponding fire rated frames in accordance with NFPA No. 80.

D. Job Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire rated doors. Trim door height at bottom edge only. Machine doors for hardware. Seal cut surfaces after fitting and machining.
   1. Fitting Clearances for Nonrated Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/4" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold. Bevel nonrated door 1/8" in 2" at lock and hinge edges.
   2. Fitting Clearances for Fire Rated Doors: Comply with NFPA 80. Bevel fire rated doors 1/8" in 2" in lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Glazing: Coordinate installation of glazing with Section 088000 Glazing.

3.3 ADJUSTMENTS AND PROTECTION

A. Operation: Rehang or replace doors which do not swing or operate freely.

B. Protection of Completed Work: Protect installed wood doors from damage or deterioration until acceptance of work.

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SECTION 083113
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Access doors.

1.2 QUALITY ASSURANCE

A. Fire Resistance Access Doors and Frames: Provide units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 or UL 10B for vertical access doors and frames.
   2. ASTM E119 or UL 263 for horizontal access doors and frames.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices.

B. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment and indicate on submittal schedule.

C. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Access Door (Fire Rated): KRP-150FR, size as noted on drawings, as manufactured by Karp Associates, Inc. or accepted equal.
   1. Frame shall be 16 gauge steel.
   2. Door shall be 20 gauge steel, welded pan type.
   3. Flange of door shall be 1" wide, 16 gauge steel.
   4. Hinges shall be continuous.
   5. Door shall be filled with 2" thick fire rated insulation.
   6. Door shall have automatic closer, be self-latching, no straps and contain interior latch release.
   7. Latch shall be flush to finished surface of door and shall utilize Allen Head Security Latch.
   8. Provide masonry anchor straps or mounting holes for installation in substrates as shown on drawings.
   9. Base metal shall be steel with prime coat of rust inhibitive electrostatic powder, baked enamel typical.
      a. Provide stainless steel with No. 4 satin polish finish in bathrooms, shower rooms and toilet rooms.
      b. Provide painted finish to match adjacent wall color, with spray application in all other locations.
   10. Fire rating shall be 45 minutes for use in a one hour fire-rated wall and 1-1/2 hour for use in a two hour fire-rated wall.
   11. Size: As indicated on drawings unless noted otherwise.
   12. Location: All access doors indicated at fire rated partitions shall be fire rated access doors.

B. Access Door: DSC-214M, size as noted on drawings, as manufactured by Karp Associates, Inc. or accepted equal.
   1. Frame shall be 16 gauge steel.
   2. Door shall be 14 gauge steel.
   3. Flange of frame shall be one piece construction, 3/4" wide, 16 gauge steel.
   4. Hinges shall be a concealed continuous piano hinge.
   5. Latch shall be flush to finished surface of door and shall utilize Allen Head Security Latch.
   6. Provide masonry anchor straps or mounting holes for installation in substrates as shown on drawings.
   7. Base metal shall be steel with prime coat of rust inhibitive electrostatic powder, baked enamel typical.
      a. Provide stainless steel with No. 4 satin polish finish in bathrooms, shower rooms, and toilet rooms.
      b. Provide painted finish to match adjacent wall color, with spray application in all other locations.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors.

B. Coordinate installation with work of other trades.

C. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

3.3 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels of frames which are warped, bowed or otherwise damaged.

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SECTION 083500
SIDE FOLDING DOORS

PART 1- GENERAL

1.1 SUMMARY

A. Work Included: Side folding grille.

1.2 QUALITY ASSURANCE

A. Furnish each service door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data, roughing-in diagrams and installation instructions for each type and size of door. Include operating instructions and maintenance information.

B. Shop Drawings: Submit shop drawings for each installation.

C. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Side Folding Grille: Bi-parting Side Folding Door "Slim Line" by Dynamic Closures Corporation, or accepted equal.
   1. Curtain:
      a. Panels: 7-1/4 inch wide with 5-1/4 inch high alternating top plates of truss like aluminum and full height aluminum panels with now viewable area.
      b. Curtain Height: See drawings.
      c. Locking Post: On one section of door to allow doors to lock in middle of opening.
      d. Overhead Track: Extruded Aluminum, 1-3/8 inches wide by 1-5/8 inches high, with continuous extruded profile seamed together by Alignment Bars and Track Pins. Track to accept 1-1/8 inch nylon Trolleys and carry weight of complete curtain.
      e. Finishes: All members to be clear anodized.
      f. Operation: Manual push-pull. Provide pull straps at countertop applications.
      g. Pocket Doors: Provide manufacturer's standard pocket doors at both pockets.

2.2 FABRICATION

A. Fabricate with every fourth vertical rod as a hanger rod. Provide tube spacers at each hanger rod to maintain chain spacing.

B. Hinge Panels: Continuous rows between top two and bottom two chain sets.

C. Intermediate Members: Spacing not to exceed 10 feet on center.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install grille, track and complete with necessary hardware, anchors, inserts, hangers and supports in accordance with final shop drawings, manufacturer's instructions and as herein specified.

B. Upon completion of installation, including work by other trades, lubricate, test and adjust doors to operate easily.

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SECTION 084100
ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Aluminum storefront frames.
   2. Aluminum doors.

1.2 QUALITY ASSURANCE

A. Standards: Comply with the American Architectural Manufacturer's Association (AAMA) reference standards.

B. Single Source Responsibility: Obtain aluminum doors and framing from one source and from a single manufacturer.

C. Manufacturer Qualifications: Manufacturer shall have been engaged in the manufacturer of aluminum storefront as required for this project for a minimum of five years.

D. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum storefront in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance for a period of not less than 5 years.

1.3 PERFORMANCE REQUIREMENTS

A. Performance and Testing Requirements: Provide storefront conforming to the AAMA/WDMA/CSA 101/I.S.A/A440 requirements and to the following specific performance requirements.
   1. Wind Loads: Storefront system shall withstand wind pressure loads normal to wall plane indicated:
      a. Positive Pressure: 20 psf.
      b. Negative Pressure: 20 psf.
   2. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330 shall be less than L/175 or 3/4" maximum.
   3. Condensation Resistance Factor: Tested in accordance with AAMA 1503, the condensation resistance factor of the frame shall not be less than 57.
   4. Air Infiltration: Storefront systems shall not exceed 0.06 cfm/ft^2 infiltration when tested in accordance with ASTM E 283 at differential static pressure of 6.24 psf.
   5. Water Infiltration: No water leakage when tested in accordance with ASTM E 331 at a static pressure of 8 psf.

1.4 SUBMITTALS

A. Product Data: Manufacturer's technical product data substantiating that products comply with requirements, including:
   1. Manufacturer's standard details and fabrication methods.
   2. Data on finishing, hardware and accessories.
   3. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop Drawings for each, including:
   1. Layout and installation details, including relationship to adjacent work.
   2. Elevations at 1/4" scale.
   3. Detail sections of typical composite members.
   4. Anchors and reinforcement.
   5. Hardware locations and mounting heights.
   6. Provisions for expansion and contraction.
   7. Glazing details.
   8. Accessories.

C. Samples
   1. Samples for Initial Color Selection: Submit samples of each specified finish on manufacturer's color charts.
   2. Samples for Final Color Selection: Submit samples of each specified finish on metal substrate. Where finishes involve color variation provide samples showing full range of variations expected.

D. Performance Test Reports: Provide test reports, from AAMA accredited laboratories certifying the performance.

E. Manufacturer's Warranty: Submit copy of manufacturer's warranty covering workmanship and materials.

F. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.5 JOB CONDITIONS

A. Product Handling

1. Deliver storefront components in the manufacturer's original protective packaging.
2. Store storefront components in a clean dry location in a manner to permit circulation of air.
3. Store storefront components in a manner that will prevent bending and avoid damage.
4. Comply with AAMA CW-10 for handling and protection until project completion.

B. Field Measurement
1. Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings.

1.6 WARRANTY

A. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents. Warranty windows against failure to include: excessive air infiltration, excessive deflections, faulty operation of sash, deterioration of metal finish in excess of normal weathering, visual obstruction of glass due to internal moisture, and defects in hardware, weatherstripping and accessories. Warranty to extend for 2 years on storefront units.
1. Paint Finish: Warrant for 15 years against chipping, peeling, cracking, chalking, or fading.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Storefront Type 1: Trifab VG 451UT by Kawneer or accepted equal.
1. Material: Extruded Aluminum, ASTM B221, 6063-T6 alloy and temper.
2. Frame Profile: 2" wide x 4-1/2" deep.
3. Frame Wall Thickness: Minimum .125" thickness unless additional thickness or reinforcing is required to meet performance requirements.
4. Assembly: Shear block or screw spline.
5. Glazing Plane: As indicated on drawing.
6. Thermal Break: Dual Isolock thermal break with two ¼" high density polyurethane separation, mechanically and adhesively joined to aluminum.
7. U- Factor Assembly: 0.36
8. Fasteners: Aluminum or stainless steel compatible with aluminum window members, trim hardware, anchors, and other components.
9. Anchors, Clips, and Accessories: Aluminum stainless steel, or zinc-coated steel, provide sufficient strength to withstand design pressure indicated.
10. Flashing, Panning, Receptors, and Trim: Shop bent or extruded aluminum sheet conforming to ASTM 8209 nominal, .062" wall; with exposed surfaces finished after bending/forming to match color and finish performance. Concealed fasteners where possible.
11. Finish: #22 Permafluor Fluoropolymer Coating (70% PVDF) conforming to AAMA 2605 in manufacturer's standard colors. (Note: This includes nonmetallic high performance colors.)
12. Operable Vent: Glass Vent UT by Kawneer or accepted equal. Finish to match adjacent framing.
    a. Operation: Out-swing casement.

b. Hardware: Hinging hardware shall consist of manufacturer's standard stainless steel 4-bar hinge. Locking hardware shall consist of manufacturer's cast white bronze cam lock with pole ring. All hardware fasteners penetrating the frame or inside plane of window shall be factory sealed with resilient non-hardening compound.
c. Weatherstripping: All weatherstripping shall be installed so that there is no metal-to-metal contract between the master frame and the operating vents. All weatherstripping shall be installed in specially extruded ports and secured to prevent movement or loss during normal sash operation

B. Aluminum Storefront Type 2: Trifab VG 450 by Kawneer or accepted equal.
1. Material: Extruded Aluminum, ASTM B221, 6063-T6 alloy and temper.
2. Frame Profile: 2" wide x 4-1/2" deep.
3. Frame Wall Thickness: Minimum .125" thickness unless additional thickness or reinforcing is required to meet performance requirements.
4. Assembly: Shear block or screw spline.
5. Glazing Plane: As indicated on drawing.
6. Fasteners: Aluminum or stainless steel compatible with aluminum window members, trim hardware, anchors, and other components.
7. Anchors, Clips, and Accessories: Aluminum stainless steel, or zinc-coated steel, provide sufficient strength to withstand design pressure indicated.
8. Flashing, Panning, Receptors, and Trim: Shop bent or extruded aluminum sheet conforming to ASTM 8209 nominal, .062" wall; with exposed surfaces finished after bending/forming to match color and finish performance. Concealed fasteners where possible.
9. Finish: #22 Permafluor Fluoropolymer Coating (70% PVDF) conforming to AAMA 2605 in manufacturer's standard colors. (Note: This includes nonmetallic high performance colors.)

C. Aluminum Storefront Type 3: T Trifab VG 601UT at interior applications by Kawneer or accepted equal.
6. Material: Extruded Aluminum, ASTM B221, 6063-T6 alloy and temper.
7. Frame Profile: 2" wide x 6" deep.
8. Frame Wall Thickness: Minimum .125" thickness unless additional thickness or reinforcing is required to meet performance requirements.
9. Assembly: Shear block or screw spline.
10. Glazing Plane: As indicated on drawing.
11. Thermal Break: ¼" high density polyurethane separation, mechanically and adhesively joined to aluminum.
12. Fasteners: Aluminum or stainless steel compatible with aluminum window members, trim hardware, anchors, and other components.
13. Anchors, Clips, and Accessories: Aluminum stainless steel, or zinc-coated steel, provide sufficient strength to withstand design pressure indicated.
14. Flashing, Panning, Receptors, and Trim: Shop bent or extruded aluminum sheet conforming to ASTM 8209 nominal, .062" wall; with exposed surfaces finished after bending/forming to match color and finish performance. Concealed fasteners where possible.
15. Finish: #22 Permafluor Fluoropolymer Coating (70% PVDF) conforming to AAMA 2605 in manufacturer's standard colors. (Note: This includes nonmetallic high performance colors.)

D. Aluminum Door: Wide Stile 500 by Kawneer or accepted equal.

1. Material: Extruded aluminum, ASTM B221, 6063-T6 alloy and temper.
2. Door Profile: 1-3/4" deep members, 5" wide at top rail, intermediate rail and stiles, and 10" wide at bottom rail.
3. Wall Thickness: Minimum .125" thickness.
4. Assembly: Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds.
5. Weatherstripping: Full perimeter sealair thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
6. Door Bottom: EPDM blade gasket sweep strip applied with concealed fasteners.
7. Finish System: #22 Stock Kynar 500 Fluropon coating, AAMA 2604 (50% PVDF) fluoropolymer. Custom color to match Sahara Sand of existing windows.

E. Aluminum Closure Plate:
1. Material: Aluminum plate, ASTM B209, 6061-T6 alloy and temper.
2. Thickness: 0.063 inch
3. Material shall be shop bent and finished after bending/forming has taken place.
4. Finish: #22 Permafluor Fluoropolymer Coating (70% PVDF) conforming to AAMA 2605.

F. Glazing
1. Field Glazed. See Section 088000 - Glazing.

G. Aluminum Trim, Flashing or Panning: .040" aluminum, factory brake formed prior to finishing, finish to match adjacent doors and framing.

1.7 FABRICATION

A. Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members; rigidly secure, and sealed in accordance with manufacturer's recommendations.

B. Fabrication Tolerance: Comply with AAMA standards.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which work shall be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Comply with manufacturer's specifications and recommendations for the installation of aluminum doors and frames.

B. Set units plumb, level and true to line, without warp or rack of frames, doors or panels. Anchor securely in place.

C. Separate unfinished aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

D. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

E. Adjust operating hardware to function properly for smooth operation without binding and for weathertight closure.

F. Set sill members and other members in bed of sealant to provide weathertight construction.

G. Refer to Section 088000 - Glazing for installation of glass and other panels indicated to be glazed into doors and storefront.

H. Refer to Section 079200 - Joint Sealants for sealants and joint fillers. Sealant shall be installed at the exterior and interior face of the perimeter to provide airtight and watertight joints.

3.3 CLEANING AND PROTECTION

A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

B. Protect installed work throughout the construction period against damage or deterioration, other than normal weathering.

C. Remove and replace defective work, including doors or framing which is warped, bowed and otherwise damaged.

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SECTION 085113
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Aluminum windows.
   2. Aluminum window sashes.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have been engaged in the manufacture of aluminum windows as required for this project for a minimum of five years.

B. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum windows similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance for a period of not less than 5 years.

C. Single Source Responsibility: Provide aluminum window units from one source and produced by a single manufacturer.

D. Standards: AAMA - American Architectural Manufacturers Association
   1. AAMA/WDMA/CSA 101/1.S.2/A440 “North American Fenestration Standard/Specification for Windows, Doors, and Skylights.”
   2. AAMA 502 "Voluntary Specification for Field Testing of Windows and Sliding Glass Doors"
   3. AAMA 611 "Voluntary Specification for Anodized Architectural Aluminum"
   4. AAMA 1503 "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections"
   5. AAMA CW-10 "Care and Handling of Architectural Aluminum from Shop to Site".
   6. AAMA IPCB “Standard Practice for the Installation of Windows and Doors in Commercial Buildings.”

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications, and installation instructions for each type window unit, hardware and accessories.

B. Shop Drawings: For each type of window required, include information not fully detailed in manufacturer’s standard product data and the following.
   1. Layout and installation details, including anchors.
   2. Elevations of continuous work at ¼” scale and typical window unit elevations at ¾” scale.
   3. Full-size section details of typical composite members, including reinforcement.
   4. Hardware including operators.
   5. Glazing details.
   6. Accessories.

C. Samples
   1. Samples for Initial Color Selection: Submit samples of each specified finish on manufacturer's color charts.
   2. Samples for Final Color Selection: Submit samples of each specified finish on metal substrate. Where finishes involve color variation provide samples showing full range of variations expected.
   3. Fasteners and Hardware: Submit one of each type.

D. Performance Test Reports: Provide test reports, less than 5 years old, from AAMA/WDMA/CSA accredited laboratories certifying the performance grade and performance class specified.

E. Manufacturer's Warranty: Submit copy of manufacturer's warranty covering workmanship and materials.

F. Field Constructed Mock-Ups: Complete one window installation for review by Architect. Comply with the following requirements:
   1. Locate mock-up on site as directed by Architect.
   2. Install one operable window complete with hardware and trim.
   3. Complete sealant work at exterior.
   4. Acceptable mock-up may be accepted as final installation as directed by Architect.

G. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with AAMA CW-10 for handling and protection of windows until project completion.

B. Deliver windows in protective containers, marked with identification for window location.

C. Store and handle windows in a manner that will not cause damage to the finish.

1.5 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Contractor must protect the building from the weather and maintain it in a watertight condition.

B. Field Measurements: Check actual window openings by field measurement before fabrication. Show recorded measurements on shop drawings.

1.6 WARRANTY

A. General:
   1. Contractor shall provide to the University product warranty with date of window manufacture data as described below; and shall adhere to the following:
      a. Windows furnished shall be certified as fully warranted against any defects in material or workmanship, under normal use and service for a period of two (2) years from date of window project installation substantial completion.
      b. All window frames, panning and trim, sash releases, full screens, and Omega insulated panel systems shall be provided with a Duranar, two coat PPG painted finish or 70% Kynar 500, Hylar 5000 Fluropolymer base organic painted finish conforming to AAMA 2605 testing with a minimum (15) year finish warranty against chipping, peeling, cracking, chalking or fading.

B. Total Window System Guarantee by Contractor:
   1. The Contractor shall assume full responsibility for the entire window system installation and guarantee for a period of two (2) years from date of substantial completion of project, against defective installation and workmanship at the site, and the satisfactory performance of the total window installation, to include windows, hardware, balance system, all glass, glazing, anchorage and setting system, sealing, flashings, trim, etc.; and as it relates to air, water and structural adequacy as called for in these specifications and approved shop drawings.

C. Manufacturer's Warranty:
   1. Submit manufacturer's standard warranty. Warranty period shall be two (2) years from date of substantial completion of the project.

1.7 PERFORMANCE REQUIREMENTS

A. Conformance to AW-PG80-HSspecifications in AAMA/WDMA/CSA 101/I.S.2/A440-08 when tests are performed on the prescribed 99" x 79" minimum test size with the following test results:
   1. Air Infiltration: Maximum Rate: 0.3 cfm/sq. ft. (0.5 L/s•m²) of area at an inward test pressure of 6.24 lbf/sq. ft. (300 Pa) in accordance with ASTM E283. .
   2. Water Penetration: no uncontrolled water leakage when tested per ASTM E331-09 and ASTM E547-09 at a static air pressure difference of 10 psf.
   3. Uniform Deflection: no more than L/175 when tested per ASTM E330-10 at a static air pressure difference of 80 psf.

4. Uniform Structural Load: no glass breakage or permanent damage to fasteners, and maximum .2% permanent deformation of the span of any frame member when tested per ASTM E330-10 at a static air pressure difference of 120 psf.
5. Forced-entry Resistance: latching devices shall provide reasonable security against forced entry and the test window shall achieve a Level 10 when tested per ASTM F588-07.

B. Thermal NFRC Condensation Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according ato AAMA 1503 with a CRF not less than 69 (frame) and 77 (glass) (Double Slide Window)

C. Temperature Index (I): Provide aluminum windows tested for thermal performance according to CSA-A440 with a Temperature Index not less than Single Slide: 57 (frame) and 73 (glass) or Double Slide: 36 (frame) and 74 (glass).

D. Thermal Transmittance: Provide aluminum windows tested for thermal performance according to AAMA 1503.
1. Provide aluminum windows tested for thermal performance according to AAMA 1503, with a thermal transmittance (U-factor) no more than Single Slide: 0.25 BTU/hr/sf/˚F or Double Slide: 0.28 BTU/hr/sf/˚F.
2. Provide aluminum windows simulated for thermal performance according to AAMA 507 and NFRC 100 with a thermal transmittance (U-factor) range of; Single Slide: 0.23 to 0.38 BTU/hr/sf/˚F or Double Slide: 0.25 to 0.39 BTU/hr/sf/˚F (Based on center of glass U-factor range 0.10 to 0.32 for triple glazing.

E. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for the Project that pass AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS), Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to the Project from basic wind speed indicated in miles per hour, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
    (a). Ultimate Design Wind Speed (MPH): 115
    (b). Importance Factor: II
    (c). Exposure Category: B

F. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch (19 mm), whichever is less, at design pressure based on testing performed according to AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS), Uniform Load Deflection Test or structural computations

G. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (____) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1.8 EXTRA STOCK

A. Spare Parts: Furnish the following items in the manufacturer's original containers properly labeled with the names of the items and locations to be used. Store spare parts at the site where directed by the Owner's Representative. Finishes shall match installed products.
   1. Windows: Provide spare window parts as follows:
      a. Twenty (20) sash fully glazed for operable sash of sliding window.
      b. Twenty (20) insect screens for operable sash of sliding window.
   2. Hardware: For each 20 windows of each window type, furnish one (1) complete set of hardware.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Windows: AA5450 Horizontal Sliding Window by Kawneer or accepted equal.
   1. Sliding Windows : Horizontal Sliding Thermal Aluminum Window
      a. Model: AA5450.
      b. AAMA/WDMA/CSA Performance: **AW-PG50-HS**
      c. Frame Depth: 4-1/2"
      d. Lineal Thermal break: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact. Thermal barriers shall be designed in accordance with AAMA TIR A8..
         i. Frame thermal barrier shall be polyamide with a minimum of 1" (25.4 mm) separation, installed continuously and mechanically bonded to the aluminum.
         ii. Sash thermal barrier shall be polyamide with a minimum of 1/2" (12.7 mm) separation, installed continuously and mechanically bonded to the aluminum.
      e. Aluminum Extrusions: 0.070" minimum wall thickness at any location for the main frame and sash members. Provide alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish.
      f. Weep Holes: Provide weep holes with integral hinged covers and internal passages in window frames to conduct infiltrating water to exterior.
   2. Glazing: See Section 088000. Glazing method shall be a wet/dry type in accordance with manufacturer's standards. Exterior glazing shall be silicone back bedding sealant. Thermal transmittance (U value) shall not be greater than the following:
      a. Operable Windows: 0.39
      b. Fixed Windows: 0.36
   3. Finish: #22 Permafluor Fluoropolymer Coating (70% PVDF) conforming to AAMA 2605 in manufacturer's standard colors. (Note: This includes nonmetallic high performance colors.).
   4. Accessories
      a. Material: Extruded aluminum; nominal .062" wall; with exposed surfaces finished to match window color and finish performance; concealed fasteners where possible; required weatherseals; designed for unrestricted expansion and contraction.

i. Sub frames/Receptors: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093-inch (2.4-mm) thick extruded aluminum. Miter or cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.
ii. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash.
iii. Flashing and Panning: Coordinate with Section 076200.
iv. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

5. Fasteners: Stainless steel fasteners guaranteed by the manufacturer to be compatible with the windows, anchors and other items being fastened.
6. Anchors: Window manufacturer shall design stainless steel anchorages and fasteners specific to the installation for this project complying with ASTM B633 for Type SC3 severe service conditions. Brackets or clips with fasteners that do not penetrate the window frame members.
7. Hardware:
   a. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.
   b. Sliding window hardware: Provide hardware to easily operate the sash in either direction.
      i. Handle: Continuous with integral pull.
      ii. Sash Locks: Spring-loaded, snap-type lock on bottom rail of lower sash.
      iii. Composite adjustable tandem roller.
      iv. Stainless Steel roller track.
      v. Standard auto lock.
      vi. Limit device.
8. Insect Screens:
   a. Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on outside of window and provide for each operable exterior sash.
   b. Extruded aluminum frames shall meet the requirements of ANSI/SMA 1004 with not less than 0.050” wall thickness.
   c. Screen frame finish to match window frames.
   d. Aluminum screen fabric with 18 x 16 mesh/inch.
   e. Color: Charcoal Grey.
   f. Wire Size: 0.011 inch.
   g. Flat screens shall be attached with tamperproof pan head screws (2) at the top of the screen and (2) at the bottom. Screen frames exceeding 40” in an y direction, shall also be mechanically attached at the midpoint (with a tamperproof screw) either through the screen frame directly, or with a low profile screen clip and tamperproof screw, that is finished the same as the window and has the same finish. All tamperproof screws shall have the same, matching security bit for removal.

9. Weatherstripping:
   a. Provide full-perimeter weatherstripping for each operable sash.
   b. Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
   c. Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

2.2 FABRICATION

A. Field measure and coordinate all dimensions prior to fabrication.

B. General: Provide manufacturer's standard fabrication which complies with indicated standards and allows for reglazing without dismantling sash framing.

C. Pre-glazed Fabrication: Pre-glaze window units at factory. Comply with manufacturer's standards in addition to requirements of ANSI/AAMA 302.9

D. Weatherstripping: Fabricate with weatherstripping at perimeter of each operating sash. Install weatherstripping in specially extruded ports.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which the work is to be installed. Do not proceed with the work until all unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Protection: Contractor shall protect all adjacent surfaces from damage during the performance of the Work of this Contract.

3.3 INSTALLATION

A. The work of this section in accordance with the manufacturer's printed installation instructions, approved shop drawings and AAMA IPCB.

B. Metal Protection: Where aluminum will contact dissimilar materials, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

C. Set window units securely in place, plumb, level, aligned, without warp of framed or sash. Provide noncompressible plastic shims to produce plumb and level conditions.

D. All window anchorage shall be accomplished without dismantling the glass, the glazing bead or the window in any manner. Manufacturer shall be responsible for anchorage design.

E. Partially-expanding urethane foam insulation shall be injected between window frame and the rough opening to provide an air tight seal.

F. Sealants and Joint Fillers: Refer to Section 079200 - Joint Sealants. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction. Sealant shall be installed at the exterior and interior face of the window perimeter to provide airtight and watertight joints.

G. Install aluminum window system and components to drain condensation, water penetrating joints, and moisture migrating within sliding sash to the exterior.

H. Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.

3.4 CLEANING AND PROTECTION

A. Clean aluminum surface promptly after installation of windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt and other substances. Lubricate hardware and other moving parts.

B. Protect window units from damage or deterioration other than normal weathering.

3.5 FIELD TESTING

A. The Owner shall engage a qualified testing agency to test final in place window assembly in accordance with AAMA 502 using Test Method B, and provide test reports of the results. Architect shall select window units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. The Owner shall:
   1. Test two (2) openings in the base bid as selected by the Architect.
   2. All tests shall be performed in the presence of the Architect.
   3. Air infiltration and water penetration resistance test pressure shall be the same as those required for compliance with ANSI/AAMA/NWWDA 1.1-I.S.2/A440, for the Performance Grade and Class specified.
      a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.15 cfm per foot of crack length, whichever is greater.
      b. Water Penetration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf.
   4. Non-compliant work shall be corrected and re-tested as specified above. Costs for correction and re-testing shall be at the contractor's expense. Correct all other non-compliant work in the same manner, at no additional cost to the Owner.
   5. In the event of testing failure, the condition shall be corrected and one additional unit, as selected by Owner, shall be tested.

B. The contractor shall provide a field operation test of all operable window prior to final completion of the project. The test shall include the following:
   1. Checking operation of all window hardware.
   2. Inspection of window screens for defects.

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SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Finish hardware.

1.2 REFERENCE

A. Section 281300 Security System for access control requirements.

1.3 QUALITY ASSURANCE

A. Provide all finish hardware necessary for complete job except such items as are excluded, with proper type screws and accessories for attachment of each item. It is not intended that this specification mention each particular item, but that it gives information for determining the kinds, quality and finish required.

B. Finish Hardware Schedules are not statement of quantities required. They are intended to indicate basic combinations and functions, by groups. All doors may not be listed but those omitted shall be furnished hardware the same as for other similar locations. The Contractor is required to check drawings and coordinate the number of openings, door swings and functions with the schedule.

1.4 KEYING

A. Final keying to be done by Owner in cores supplied by Contractor. Refer to paragraph 2.5.

1.5 SUBMITTALS

A. Hardware Schedule: Submit final hardware list to include:
   1. Manufacturer's name and catalog number.
   2. Material and finish.
   3. Location of doors: "from _____ to _____ "
   4. Cuts of each item submitted.

B. Hardware Templates: Provide hardware templates for use by manufacturers of all doors and frames.

C. Furnish to the Owner two (2) of each special tool required to install the hardware for this project.

D. Furnish to the Owner two (2) WT2 diagnostic testing units associated with the access control system.

E. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.

2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.6 WORKMANSHIP AND PACKAGING

A. All hardware shall be of uniform color and reasonably free from imperfections affecting the appearance serviceability. It shall be suitable and adapted for its required use for its respective locations.

B. Should any hardware, as specified, fail to meet the intended requirements or require modifications to suit the intended location, the Contractor shall notify the Architect immediately in writing. Information shall be brought to the attention of the Architect for correction in ample time to avoid delay in the manufacture and delivery of hardware, to have it ready for use when needed.

C. Hardware shall be carefully packed and assorted and shall be legibly and accurately labeled as to its location in the work as listed in the approved Hardware Schedule.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers as herein specified have been chosen for quality and specific design appearance. In judging proposed "equal" substitutes, the Architect will consider both characteristics. The Architect's decision shall be final. Listed below are manufacturer's that are approved provided they provide items of equal quality and design as the manufacturer whose numbers are listed in hardware schedule.

ITEM	SCHEDULED MANUFACTURER	ACCEPTABLE ALTERNATE MANUFACTURERS
Hinges & Electric Hinges	McKinney	Stanley, Hager
Continuous Hinges	Markar	Stanley, Select Products
Locksets	Sargent	No substitutions
Cores	Best, with	**No substitutions**

	interchangeable cores & F keyway	
Exit Devices	Sargent	Von Duprin, Precision
Power Connectors	McKinney	
Power Transfer	Securitron	
Closers	Hager	Sargent, LCN
Overhead Stops	Sargent 1548S	
Hold Open	Rixson	
Automatic Door Opener	Norton	Precision, LCN
Proximity Reader	HID	
Door Contact	Securitron	GE
Flush Bolts, Coordinators	Ives	Rockwood, Hager
Protection Plates, Push Plates, Pulls	Rockwood	Ives, Hager
Wall Bumpers	Rockwood	Ives,
One-Way Viewer	Ives	Rockwood
Thresholds, Weatherstrip	Pemko	National Guard Products,
Bifold Hardware	L.E. Johnson Products	or accepted equal

2.2 SCHEDULE OF FINISH HARDWARE

A. The hardware, as scheduled in this section, is intended to describe the types and quantities of hardware required for typical door in a particular group. Doors are grouped according to similarity of usage and hardware.

B. List of hardware submitted by the Contractor will be corrected as to quality and kind of hardware selected. The Contractor will be responsible for all quantities and hands of locks and must submit supplemental list as necessary to cover the items of hardware not included in the original submittal.

C. Each door to have a complete set as listed for the group in which it appears. All butts to have MS or WS or a combination of both according to frame conditions.

D. Provide screws, bolts and fasteners as required for complete installation. All exposed screws fastening hardware shall be Phillips head type.

E. Door Closers: Mount on room side face of doors. Exterior doors shall have closers mounted parallel arm type.

F. Wall Door Stops: Specified in schedule by type only. Submit mounting type (i.e. toggle bolts at drywall, expansion anchors at masonry) and actual model designations.

G. Provide three silencers at each door.

2.3 HINGES

A. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

B. Templates: Except for hinges to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Screws: Provide Phillips flat-head screws. Finish screw heads to match surface of hinges.

D. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   1. Steel Hinges: Steel pins.
   2. Non-ferrous Hinges: Stainless steel pins.

2.4 CONTINUOUS HINGES

A. Provide single hinge for full height of door. Hinge shall be barrel type rated for 600-pound doors minimum, meeting ASTM 156.1 test for 1,500,000 cycles. Base material shall be 14-gauge steel or stainless steel, finished as indicated.

B. Pin: Provide a single continuous stainless steel .25" diameter pin. Knuckles shall be 2" each, with Nylon bearings at each separation.

C. Templates: Provide only template-produced units with symmetrical hole pattern. Provide a minimum of 21 fasteners on the door and 21 fasteners on the frame. Coordinate templating and cutouts with specific requirements for special hardware such as power transfers.

D. Screws: Provide Phillips flat-head screws, with finish to match hinge. Provide security head screws where indicated (SHS).

E. Coordinate mounting of fire door rating label with continuous hinge.

2.5 LOCK CYLINDERS, CORES AND KEYING

A. General: Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.

B. Provide cylinder and Best interchangeable 7-pin core with F keyway for each lockset and exit device as required by function. Cores to be turned over to Owner for final keying and installation.

C. Equip locks with cylinders for interchangeable-core pin tumbler inserts.

D. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

2.6 LOCKS, LATCHES AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

   1. Provide 6 hole strikes at aluminum frames.

B. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

C. Lock Throw: Provide 5/8" minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

D. Provide ½" minimum throw on other latch and deadlock bolts.

E. Locks shall meet these certifications: ANSI A156.13 1987 Grade 1 Operational, Grade 3 Security, ANSI/ASTM F476-76 Grade 20.

F. Flush Bolt Heads: Minimum of ½" diameter rods of brass, bronze or stainless steel, with minimum 12" long rod for doors up to 7'-0" in height. Provide longer rods as necessary for doors exceeding 7'-0" in height.

G. Exit Device Dogging: Except on fire-rated doors, wherever closers are provided on doors equipped with exit devices, equip the units with hex keyed dogging device to hold the push bar down and the latch bolt in the open position.

2.7 PUSH/PULL UNITS

A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation; through-bolted for matched pairs, but not for single units.

2.8 CLOSERS AND DOOR CONTROL DEVICES

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

B. Closers
1. Ten year warranty for hydraulic units.
2. Two year warranty for electrical and/or handicap power assist door closers.
3. Written certification from and independent test laboratory showing successful completion of a minimum of 10,000,000 cycles must be provided.
4. Cylinder:
   a. Shall be of high strength cast iron construction.
5. Shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16" and piston diameter of 1½".
   a. Closer shall utilize full complement bearings at shaft.
   b. Pinion and pistons shall be hardened regardless of closer size.
   c. The closer shall incorporate tamper resistant non-critical screw valves of V-slot design to reduce possible clogging. Closer shall have separate and independent screw valve adjustments for latch speed, general speed and hydraulic backcheck.
6. Parallel Arm Closers: Shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" x ½" steel stud shoulder bolts, shall be incorporated in regular arms, hold open arms, arms with stop built in, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, and durability. Where closers with built-in positive stops are used, the stops shall be of one piece cast malleable iron material.
7. Closer shall be furnished with stick on type template for accurate installation and ease of installation. Universal mount closers shall not be acceptable.

8. Hydraulic Fluid: All closers, with the exception of interior closers, shall utilize temperature stable fluid capable of withstanding temperature ranges of 120°F to -30°F without requiring seasonal adjustment of closer speed to properly close the door.

2.9 EXIT DEVICES

A. General: All devices and mullions shall be of one manufacturer to provide for proper installation and servicing. Devices shall be furnished non-handed and capable of direct field conversion for all available trim functions. All devices shall carry a three year warranty against manufacturing defects and workmanship.

B. Devices shall be push through type touch pad design with a straight or horizontal motion to eliminate pinch points.

C. Springs: Only compression springs are acceptable. All internal parts shall be zinc dichromate coated to prevent rusting.

D. Quiet Feature: All devices shall incorporate a hydraulic sound damper to reduce noise. All devices shall have a deadlocking feature for deadlocking the latchbolt.

E. Mount devices so that centerline of exit device is 36 inches above finish floor unless otherwise noted on drawings.

2.10 DOOR TRIM UNITS

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops and similar units); either machine screws or self-tapping screws.

B. Fabricate edge trim of stainless steel, not more than ½" nor less than 1/16" smaller in length than door dimension.

C. Fabricate protection plates not more than 1½" less than door width on stop side and not more than ½" less than door width on pull side, x the height indicated.

D. Metal Plates: Stainless steel, .050" (U.S. 18 ga.).

2.11 WEATHERSTRIPPING

A. General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.

2.12 THRESHOLDS

A. General: Except as otherwise indicated provide standard aluminum threshold unit of type, size and profile as shown or scheduled.

2.13 DOOR SILENCERS

A. All hollow metal frames shall have grey resilient type silencers. Quantity (3) on single doors and quantity (4) on pair of doors.

2.14 SCHEDULE OF FINISH HARDWARE

Typical Door Operation:

1. *Any door with an electric lockset will be programmed so that the associated proximity reader will unlock the door via the electric lockset.*
2. *Any door with an electric lockset with a door contact/position switch will be connected to the campus security system to allow for Campus Security to know when door is left ajar.*

GROUP 1 (Storeroom Function, Non-Rated, Access Control) *(Bedroom Doors)*

EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Wall Bumper	406 x 612
1 One-Way Viewer	700 US26D (@ 60" a.f.f.)

GROUP 1A (Storeroom Function, Rated, Access Control) *(Suite Doors)*

EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Kick plate	K1050F x 12" x 2" LWD x US26D
1 Wall Bumper	406 x 612
1 One-Way Viewer	700 US26D (@ 60 " a.f.f.)

GROUP 1B (Storeroom Function, Rated, Access Control) *(Suite Doors, Accessible)*

EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Kick plate	K1050F x 12" x 2" LWD x US26D
1 Wall Bumper	406 x 612
2 One-Way Viewer	700 US26D (one @ 42" a.f.f. & one @ 60 " a.f.f.)

GROUP 1C (Storeroom Function, Rated, Access Control)

See Specification Section 088860 – Fire Protection Systems.

GROUP 1D (Storeroom Function, Rated, Access Control, Automatic Operator)
See Specification Section 088860 – Fire Protection Systems.

GROUP 2 (Storeroom Function, Non-Rated, Access Control)
EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Kick plate	K1050 x 12" x 2" LWD x US26D
1 Wall Bumper	406 x 612

GROUP 2A (Storeroom Function, Rated, Access Control)
EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Hold Open	994 (Door 005 Only)
1 Kick plate	K1050F x 12" x 2" LWD x US26D
1 Wall Bumper	406 x 612

GROUP 2B (Storeroom Function, Rated, Access Control, Double Door)
EACH TO HAVE:

5 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
2 Door Closer	5100 x ALM x HD x FC
1 Coordinator	COR60 x FL (as required) x US26D
1 Set Flush Bolts	FB51P x US26D
2 Kick plate	K1050F x 12" x 2" LWD x US26D
1 Wall Bumper	406 x 612

GROUP 2C (Storeroom Function, Access Control, Exterior Door)
EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US32D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US32D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Overhead Stop	1548S
1 Kick plate	K1050 x 12" x 2" LWD x US32D (push side)

GROUP 3 (Privacy Function, Rated) *(Public Toilet Rooms)*
EACH TO HAVE:

3 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Lockset	93K x 7 x L x 16K x US26D
1 Door Closer	5100 x ALM x HD x FC
1 Wall Bumper	406 x 612
1 Kick plate	K1050F x 12" x 2" LWD x US32D

GROUP 3A (Privacy Function) *(RD Apt. Bedrooms & Bathroom)*
EACH TO HAVE:

3 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Lockset	93K x 7 x L x 16K x US26D
1 Wall Bumper	406 x 612

GROUP 4 (Passage Function, No Lockset, Non-Rated) *(Resident Bathrooms)*
EACH TO HAVE:

3 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Door Closer	5100 x ALM x HD x FC
1 Pull	106 X 70C x stainless steel
1 Push Plate	71C
1 Wall Bumper	406 x 612
1 Kick plate	K1050 x 12" x 2" LWD x US32D

GROUP 4A (Passage Function, No Lockset, Automatic Operator, Cross-Corridor Doors)
EACH TO HAVE:

6 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
2 Pull	110 X 70C x stainless steel
2 Push Plate	71C
2 Auto. Door Opener	5700 x 689
2 Proximity Readers	RP15
2 Wall Bumper	406 x 612
2 Kick plate	K1050 x 12" x 2" LWD x US26D

Doors 021F, 100D, & 100E Operation:
General Building Occupants: Manual push/pull operation of doors.
Building Occupants Accessibility Limitations: The proximity readers located on the right hand approach side of the doors will activate the automatic operator for the door leaf on that side of the opening.

GROUP 4B (Passage Function, No Lockset, Double Doors)
EACH TO HAVE:

6 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Lockset	93K x 7 x L x 16K x US26D
1 Dummy Trim	1DT x 16K x US26D
1 Flush Bolts	FB31P
2 Floor Bumper	401/402 x US26D
2 Kick plate	K1050 x 12" x 2" LDW x US26D

GROUP 4C (Passage Function)
EACH TO HAVE:

3 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Lockset	93K x 7 x L x 16K x US26D
1 Wall Bumper	401/402 x US26D

GROUP 6 (Exit Device, Access Control, Automatic Operator, Inner Vestibule, Double Doors)

EACH TO HAVE:

2 Continuous Hinge	FM300 x US32D
2 Power Transfer	EL-CEPT
2 Exit Device	70 x 55 x 56 x NB8706 x ETP x US32D
Power Connectors	(2) QC-C1500 @ frame, (2) QC-CXXXP @ door, add'l units as required to complete connections for functionality
2 Door Contacts	DPS-M
2 Auto. Door Opener	6300 x 689
2 Overhead Stop	1548S
2 Proximity Readers	RP15
1 Threshold	8426BR
1 Weatherstrip	Full Perimeter, 132NA
1 Door Sweep	203NA

Door Operation Doors 100A:

General Building Occupants: The proximity reader located on the west wall of the vestibule will be programmed to unlock the west leaf of Door 100A. Exit devices will be utilized for exiting.
Building Occupants Accessibility Limitations: The proximity reader located on the west wall of the vestibule will be programmed to unlock the west leaf of Door 100A then activate the automatic door opener for the leaf. The proximity reader in Entry 100A will retract the latch on the east leaf of Door 100A then activate the automatic door opener on the leaf.

GROUP 6A (Exit Device, Automatic Operator, Outer Vestibule, Double Doors)

EACH TO HAVE:

2 Continuous Hinge	FM300 x US32D
2 Exit Device	8895 dummy trim x US32D with ETP
2 Auto. Door Opener	6300 x 689
2 Overhead Stop	1548S
2 Proximity Readers	RP15
1 Threshold	8426BR
1 Weatherstrip	Full Perimeter, 132NA
1 Door Sweep	203NA

Door Operation Door 100B:

General Building Occupants: The pulls will be used to open the door. Exit devices will be utilized for exiting.
Building Occupants Accessibility Limitations: The proximity reader located outside of building will activate the automatic door opener for the west door leaf at Door 100B. The proximity reader on the east side of the vestibule will activate the automatic door operator on the east leaf of Door 100B.

GROUP 7 (Exit Device, Access Control, Automatic Operator, Inner & Outer Vestibule)

EACH TO HAVE:

1 Continuous Hinge	FM300 x US32D
1 Power Transfer	EL-CEPT
1 Exit Device	70 x 55 x 56 x 8804 x ETP x US32D
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Contacts	DPS-M
1 Auto. Door Opener	6300 x 689
2 Proximity Readers	RP15
1 Wall Bumper	406 x 612

1 Threshold	8426BR
1 Weatherstrip	Full Perimeter, 132NA
1 Door Sweep	203NA

Door Operation Doors 021D & 021E:
General Building Occupants: The proximity reader located outside of building will be programmed to unlock Door 021E. The proximity reader located on the east wall of Vestibule will be programmed to unlock Door 021D. Exit devices will be utilized for exiting.
Building Occupants Accessibility Limitations: The proximity reader located outside the building will be programmed to unlock Door 021E then activate the automatic door opener on the leaf. The proximity reader located on the east wall of Vestibule will be programmed to unlock Door 021D then activate the automatic door opener on the leaf. The proximity readers located on the inside of each door leaf will unlock the door then activate the automatic door opener on the door.

GROUP 8 (Exit Device, Stair, Passage, Rated)

EACH TO HAVE:

3 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Exit Device	8815 x ETP x US26D
1 Door Closer	5100 x ALM x HD x FC
1 Wall Bumper	406 x 612
1 Kick plate	K1050F x 12" x 2" LWD x US26D (push side)

GROUP 8A (Exit Device, Stair, Passage, Rated)

See Specification 088860 Fire Protection Systems

GROUP 8B (Exit Device, Stair, Exterior Door)

EACH TO HAVE:

1 Continuous Hinge	FM300 x US32D
1 Power Transfer	EL-CEPT
1 Exit Device	70 x M1 x 8874 x IPS-03 x ETP x US32D with built-in RX
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Overhead Stop	1548S
1 Door Contact	DPS-M
1 Wall Bumper	406 x 612
1 Kick plate	K1050F x 12" x 2" LDW x US32D
1 Threshold	8426BR
1 Weatherstripping	Full perimeter, 132NA
1 Door Sweep	203NA

GROUP 8C (Exit Device, Stair, Exterior Door, Exit Only)

EACH TO HAVE:

1 Continuous Hinge	FM300 x US32D
1 Exit Device	8810 x ETP x US32D
1 Door Closer	5100 x ALM x HD x FC
1 Overhead Stop	1548S
1 Door Contact	DPS-M
1 Threshold	8426BR
1 Weatherstripping	Full perimeter, 132NA
1 Door Sweep	203NA

GROUP 8D (Exit Device, Stair, Rated, Access Control)

EACH TO HAVE:

1 Continuous Hinge	FM300 x US32D
1 Power Transfer	EL-CEPT
1 Exit Device	70 x M1 x 8804 x ETP x US32D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Wall Bumper	406 x 612
1 Kick plate	K1050F x 12" x 2" LWD x US26D (push side)

GROUP 9 (Storeroom, Access Control, Rated)

See Specification 088860 Fire Protection Systems

GROUP 9A (Storeroom, Access Control, Rated, Double Doors)

See Specification 088860 Fire Protection Systems

GROUP 10 (Lift Door, Automatic Operator, Non-Rated)

EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Auto. Operator	6300 x 689
1 Wall Bumper	406 x 612
1 Kick plate	K1050 x 10" x 2" LDW x US26D

GROUP 10A (Lift Door, Automatic Operator, Rated)

EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Auto. Operator	6300 x 689
1 Wall Bumper	406 x 612
1 Kick plate	K1050F x 10" x 2" LDW x US26D

(Hardware groups 10 & 10A at Doors 115A & 115B: Installation of door hardware and doors must be coordinated with lift manufacturer and installer.)

Lift Door Operation:

The proximity readers at each lockset will release the key lock at the lift controls to allow for operation. When the lift is activated (or called) by the lift controls the lift will respond to the level it is called to. When the lift arrives at the level the automatic door opener shall be activated by the lift to automatically open the lift door.

GROUP 11 (Storeroom Function, Rated)

EACH TO HAVE:

3 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Lockset	93K x 7 x D x 16K x US26D
1 Door Closer	5100 x ALM x HD x FC
1 Wall Bumper	406 x 612

GROUP 12 (Bifold Doors)

EACH TO HAVE:

6 Hinge	200326D2 x 3-1/2" x 3-1/2" x US26D
3 Set	200FD482 Heavy Duty Hardware

GROUP 13 (Gate)

EACH TO HAVE:

1 Lockset	2100 x 4908BKN x 630 (knurled lever) by Stanley
3 Hinges	Self-Closing gate hinges

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect substrates and conditions under which finish hardware is to be installed. Do not proceed with installation until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Provide complete installation including necessary cutting, mortising, patching and drilling of any work as required, in strict accordance with manufacturer's directions and templates. Check hardware list before installation for proper allocation of items.

B. Provide smooth operation of all hardware and doors.

C. Where field painting is required, hardware shall be removed and then reinstalled.

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SECTION 088000
GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Glass and glazing.

B. Related Work Specified Elsewhere: Factory glazed windows and doors.

1.2 QUALITY ASSURANCE

A. Basic Objective: Provide systems to withstand normal thermal movement, wind loading and impact loading (where applicable) without failure, including the following conditions.
   1. Loss or breakage of glass.
   2. Failure of sealants or gaskets to remain watertight and airtight.
   3. Deterioration of glass and glazing materials.
   4. Other defects in the work.

B. Single Source Responsibility: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated. Materials shall be composed of primary glass obtained from a single source for each type and class required.

C. Standards
   1. Glazing, General: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual", except where more stringent requirements are indicated.
   2. Primary Glass Products: ASTM C1036.
   3. Heat-Treated Glass Products: ASTM C1048.
   4. Safety Glazing: Provide type of products indicated or required by authorities, complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   5. Insulating Glass Units
      a. ASTM E774.
      b. Certification by Insulating Glass Certification Council (IGCC). Permanently mark spaces or component pane of each unit.
   6. Structural Design: Comply with ANSI A58.1 - Minimum Design Loads for Buildings.

1.3 SUBMITTALS

A. Product Data: Manufacturer's technical data for each material and fabricated product required, including installation and maintenance instructions.

B. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of

raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

C. Samples
   1. 12" squares of each type of glass indicated, except for clear single pane units.
   2. 12" long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system.

D. Certification: Manufacturers' certificates attesting that furnished materials comply with requirements. Materials bearing manufacturer's permanent labels designating type and thickness of glass can replace separate certification, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

1.4 JOB CONDITIONS

A. Environmental Conditions
   1. Glaze only when ambient and substrate temperature conditions are within the limits permitted by glazing material manufacturer.
   2. Do not glaze when joint substrates are wet due to rain, frost, condensation or other causes.
   3. Install glazing sealants only when temperatures are in middle third of temperature range recommended by manufacturer.

B. Protect glass and glazing materials before, during and after installation. Repair or replace damaged materials at no additional cost to Owner.
   a. Insulated glass shall be warranted against visual obstruction resulting from film formation or moisture between glass surfaces (excluding glass breakage) for a period of five (5) years from date of manufacturer.

1.5 WARRANTY

A. Insulated glass shall be warranted against visual obstruction resulting from film formation or moisture between glass surfaces (excluding glass breakage) for a period of five (5) years from date of manufacture.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General
   1. Fabricate with edge clearances and tolerances complying with recommendations of glass manufacturer.
   2. Thickness
      a. Fabricate in thicknesses indicated.
      b. If thicknesses are not indicated, provide 1/4" or greater thickness as recommended by manufacturer to fit openings indicated.

B. Float Glass: Type I (transparent, flat), Class I (clear), Quality q3 (Glazing Select), thickness as noted on drawings.

C. Tempered Glass: Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent, flat), Class 1 (clear), Quality q3 (Glazing Select), thickness as noted on drawings.

D. Insulated Safety Glass:
   1. Construction
      a. Dual perimeter sealants: Poly isobutylene and silicone.
      b. Air space: Continuous aluminum; no corner keys; desiccant; argon-filled.
      c. Total thickness: 1".
   2. Exterior Glass Lite:
      a. Thickness: 1/4".
      b. Tint: Clear.
      c. Type: Fully Tempered.
      d. Coating: Low E coating on #2 surface. Coating to be Solarban 60 by PPG Industries, Inc. or accepted equal.
   3. Interior Glass Lite:
      a. Thickness: 1/4".
      b. Tint: Clear.
      c. Type: Fully Tempered.
   4. Performance:
      a. Seal Durability: Conformance to ASTM E774-92; visible, permanent IGCC certification label for CBA rating level.
      b. All glass shall be the thickness and strength to meet the load requirements.
      c. U Value: 0.29.
      d. Solar Heat Gain Coefficient: (SHGC): 0.38.

E. Insulated Spandrel Glass:
   1. Construction
      a. Dual perimeter sealants: Polyisobutylene and silicone.
      b. Air Space: Continuous aluminum; no corner keys; desiccant; argon-filled.
      c. Total Thickness: 1".
   2. Exterior Glass Lite
      a. Thickness: 1/4".
      b. Tint: Clear.
      c. Type: Fully Tempered.

d. Coating: Pyrolitic Low E on #2 surface. Coating to be Solarban 60 by PPG Industries, Inc. or accepted equal.

3. Interior Glass Lite
   a. Thickness: 1/4".
   b. Tint: Clear.
   c. Type: Fully Tempered.
   d. Coating: Coating to be Opaci-Coat 300 silicone paint by Old Castle Glass. Color as selected by Architect on #3 surface.
4. Performance
   a. Seal Durability: Conformance to ASTM E774-92; visible, permanent IGCC certification label for CBA rating level.
   b. All glass shall be the thickness and strength to meet the load requirements.
   c. U Value: 0.29.
   d. Solar Heat Gain Coefficient (SHGC): 0.38.

F. Insulated Translucent Glass:
1. Construction
   a. Dual perimeter sealants: Polyisobutylene and silicone.
   b. Air space: Continuous aluminum; no corner keys; desiccant; argon-filled.
   c. Total thickness: 1".
2. Exterior Glass Lite
   a. Thickness: 1/4".
   b. Clear.
   c. Type: Tempered.
   d. Coating: Coating to be on #2 surface. Coating to be Solarban 60 by PPG Industries or accepted equal.
3. Interior Glass Lite
   a. Thickness: 1/4".
   b. Tint: Clear.
   c. Type: Tempered with Matelux Acid Etched on #3 Surface by AGC or accepted equal.
4. Performance
   a. Seal Durability: Conformance to ASTM E774-92; visible, permanent IGCC certification label for CBA rating level.
   b. All glass shall be the thickness and strength to meet the load requirements.
   c. U value: 0.3 or less.
   d. Solar Heat Gain Coefficient (SHGC): 0.4 or less.

G. Insulated Glass with Integral Blinds:
   a. Construction
      i. Sealed insulated glazing: 1-1/2" thickness.
      ii. Air Space (Between Exterior/Intermediate Lites): Continuous aluminum; no corner keys; argon-filled.
   b. Exterior Glass Lite
      i. Thickness: 1/8"
      ii. Tint: Clear.
      iii. Type: Fully Tempered.
      iv. Coating: Low E on #2 surface. Coating to Sungate 500 by PPG Industries or accepted equal.
   c. Intermediate Glass Lite:
      i. Thickness: 1/8".
      ii. Tint: As selected by Architect.

iii. Type: Fully tempered.

d. Interior Glass Lite:
   i. Thickness: 1/8".
   ii. Tint: Clear.
   iii. Type: Fully tempered.

e. Performance
   i. Tested and certified in conformance to ASTM E 2190, permanent IGCC certification label for CBA rating level.
   ii. Manufacturer to certify that all glass shall be the thickness and strength to meet the load requirement in accordance with applicable building code.
   iii. Solar Heat Gain Coefficient (SHGC) = .38.
   iv. U value: 0.30 or less.

f. Integral blinds: Provide 5/8" magnetically coupled tilt-only blind for installation in sealed insulated glass between intermediate and interior glass lites.
   i. Operation: the blind shall be operated by an externally mounted slide magnet assembly, coupled to an internal magnet assembly.
   ii. Manufacturer: OEM shades, 700 First Avenue, Ford City, PA 16226 or approved equal.
   iii. Product: 5/8" Topslide blinds.

H. Stair Balustrade Glass:
   1. Archiglass AR110 as manufacturerd by Skyline Design. 200 Lexington Avenue Suite 1416, New York, NY 10016, 212-576-2097.
   2. Thickness: ½"

I. Fire Protective Safety Glass: 5/16" FireLite Plus by Technical Glass Products or accepted equal Provide premium grade with polished surfaces both sides. Each piece shall bear appropriate Underwriter's Laboratories or Warnock Hersey labels. Film is not acceptable.

J. Preformed Glazing Tapes: Butyl-Polyisobutylene extruded tape complying with AAMA A 804.1 with or without continuous spacer rod, as recommended by manufacturers of tape and glass for application indicated.

K. Glazing Sealants: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants having performance suitable for applications indicated and conditions at time of installation. Colors as selected by the Architect from manufacturer's standard colors.

L. Glazing Gaskets: Dense elastomeric compression seal gaskets with molded or extruded neoprene or EPDM gaskets of profile and hardness required to maintain watertight seal. Comply with ASTM C864, Option 1.

M. Cleaners and Primers: Type recommended by sealant or gasket manufacturer.

N. Setting Blocks, Spacers and Edge Blocks: Neoprene or EPDM blocks or continuous extrusions, compatible with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

O. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspect receiving work for compliance with essential tolerances, including those for size, squareness, offsets at corners; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Do not proceed with glazing work until all unsatisfactory conditions are corrected.

B. Clean all receiving surfaces immediately before glazing. Remove coatings not firmly bonded to substrates.

3.2 GLAZING, GENERAL

A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Provide for necessary bite on glass, minimum edge and face clearances and adequate sealant thicknesses, with reasonable tolerances as indicated in details. Adjust to job conditions at time of installation.

C. Protect glass from edge damage during handling and installation.

D. Remove from project (and dispose of) new glass units with edge damage or other imperfections of the kind that, when installed, weakens glass and impairs performance and appearance.

E. Apply primers to joint surfaces where required for adhesion of sealants.

3.3 GLAZING INSTALLATION

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but no closer than 6", unless otherwise required. Set blocks in thin course of sealant.

B. Spacers
   1. Provide spacers inside and out, of correct size and spacing to preserve required face clearances for glass sizes larger than 50 united inches. Exception: where gaskets or glazing tapes with continuous spacer rods are used for glazing.
   2. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width. Exceptions with sealant tape, use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

E. "Wet Glazed" Installation

1. Provide compressible filler rods or equivalent backup material, as recommended by sealant and glass manufacturers to prevent sealant from extruding into glass channel weep systems.
2. Prevent sealant from adhering to joints' back surfaces.
3. Control depth of sealant for optimum performance.
4. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
5. Tool exposed surfaces of sealants to provide a substantial "wash" way from glass.

F. "Dry Glazed" Installation
1. Apply pressure sensitive tape to clean, dry glass surface. All joints shall be squared and tight; neatly butted without overlap. Do not stretch tape to make it fit. Joints should be lightly dabbed with a compatible sealant to assure a positive seal. The only joints in the tape should be at the corners.
2. Set glass units with sufficient pressure to properly place the tape sealant under pressure or compression.
3. Immediately install the preformed glazing gasket to form a pressure producing, weathertight seal around the full glass perimeter in conformance with gasket manufacturer's recommendations.

3.4 PROTECTION AND CLEANING

A. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations.

C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

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SECTION 088860
FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Fire protection wall assemblies, doors and associated hardware.

1.2 QUALITY ASSURANCE

A. Manufacturer: Obtain fire protection glass and framing system from single manufacturer. Provide secondary materials only as recommended by primary manufacturer.

B. Fire Resistance Rating: Glass and framing shall have a fire rating as noted on the drawings. Fire test shall be conducted by an approved independent testing laboratory equal to Warnock Hersey International or Underwriter's Laboratories, Inc. and should be properly labeled in accordance with the limits of their listing.

1.3 REFERENCES

A. National Fire Protection Association
   1. NFPA 80: Fire Doors and Windows
   2. NFPA 251: Fire Tests of Building Construction and Materials
   3. NFPA 252: Fire tests of Door Assemblies
   4. NFPA 257: Fire Tests of Window Assemblies.

1.4 SUBMITTALS

A. Product Data: Submit technical product data, including data that materials comply with the specifications.

B. Certificates of Compliance and Product Test Listings: Submit testing results from an independent testing agency showing compliance with requirements.

C. Shop Drawings: Submit shop drawings showing layout and sizes of individual lights and details of installation in framing components.

D. Samples: Submit 8" x 10" sample of glass fire rated panel and 12” long samples of typical framing members.

E. Warranty: Submit warranty stating the glass manufacturer shall guarantee for a period of five (5) years from the date of installation that the fire protection glass is free from defects in material and factory workmanship and that defective materials will be repaired or replaced, after proper notification, at no cost to the Owner.

F. LEED Submittals:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures’ self-declared reports that document sourcing of

raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.5 JOB CONDITIONS

A. Protect glass from damage and deterioration during handling, storage and installation.

B. Comply with manufacturer's written recommendations regarding environmental conditions under which glass can be installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fire Resistive Glass (45 minute fire rated walls): Safti-First Superlite II XL 45 interior fire-rated glazing as manufactured by the Safti-First, 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653.3333; Fax 888.653.4444; email info@safti.com; Web site www.safti.com. accepted equal.
   1. Fire rated glass and framing must be provided by a single-source, US manufacturer. Distributors of fire rated glass and framing are not to be considered as manufacturers.
   2. Make-up: Must be comprised of an inboard and outboard lite of Starphire® Ultra-Clear Low-Iron Tempered Glass by PPG protecting a clear, fire resistive, intumescent interlayer.
   3. Thickness: 3/4" (29 mm) standard.
   4. Weight: 8 lbs/sq. ft. in 3/4" (29 mm) standard profile.
   5. Visible Light Transmission: Must meet 0.90 with Starphire.
   6. Sound Transmission Rating: Must provide a minimum of STC 42 rating in 1-1/8" (29 mm) standard profile.
   7. Appearance: Must be tint-free, optically clear fire rated glazing.
   8. Fire Rating: 45 minutes with hose stream test in accordance with ASTM E-119/UL 263/ NFPA 251 as a transparent wall.
   9. Impact Safety Rating: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).

B. Fire Resistive Glass (120 minute fire rated walls): Safti-First Superlite II XL 120 interior fire-rated glazing as manufactured by the Safti-First, 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653.3333; Fax 888.653.4444; email info@safti.com; Web site www.safti.com. accepted equal.
   1. Fire rated glass and framing must be provided by a single-source, US manufacturer. Distributors of fire rated glass and framing are not to be considered as manufacturers.
   2. Make-up: Must be comprised of an inboard and outboard lite of Starphire® Ultra-Clear Low-Iron Tempered Glass by PPG protecting a clear, fire resistive, intumescent interlayer.
   3. Thickness: 1-1/2" (29 mm) standard thickness.
   4. Weight: 12 lbs/sq. ft. in 1-1/2" (29 mm) standard profile.
   5. Visible Light Transmission: Must meet 0.90 with Starphire.
   6. Sound Transmission Rating: Must provide a minimum of STC 42 rating in 1-1/8" (29 mm) standard profile.
   7. Appearance: Must be tint-free, optically clear fire rated glazing.
   8. Fire Rating: 120 minutes with hose stream test in accordance with ASTM E-119/UL 263/ NFPA 251 as a transparent wall.
   9. Impact Safety Rating: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).

C. Fire Resistive Glass (90 minute fire rated doors): Safti-First Superlite II XL 90 interior fire-rated glazing as manufactured by the Safti-First, 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653.3333; Fax 888.653.4444; email info@safti.com; Web site www.safti.com. accepted equal.
   1. Fire rated glass and framing must be provided by a single-source, US manufacturer. Distributors of fire rated glass and framing are not to be considered as manufacturers.
   2. Make-up: Must be comprised of an inboard and outboard lite of Starphire® Ultra-Clear Low-Iron Tempered Glass by PPG protecting a clear, fire resistive, intumescent interlayer.
   3. Thickness: 1-1/2" (19 mm) standard thickness.
   4. Weight: 12 lbs/sq. ft. in 1-1/2" (19 mm) standard profile.
   5. Visible Light Transmission: Must meet 0.90 with Starphire.
   6. Sound Transmission Rating: Must provide a minimum of STC 40 rating in 3/4" (19 mm) standard profile.
   7. Appearance: Must be tint-free, optically clear fire rated glazing.
   8. Fire Rating: 90 minutes with hose stream test in accordance with ASTM E-119/UL 263/ NFPA 251 as a transparent wall.
   9. Impact Safety Rating: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).

D. Fire Resistive Glass Framing System: GPX Architectural Series fire-rated steel frame system by Safti-First or accepted equal.
   1. Fire resistive, temperature rise framing system rated for 20 to 120 minutes as specified elsewhere.
   2. Internal framing: Internal tube steel framing shall conform to ASTM A501. Formed steel retainers shall be galvanized conforming to ASTM A527.
   3. Insulation: Insulate framing system against effects of fire, smoke, and heat transfer from either side. The perimeter of the framing system to the rough opening shall be firmly packed with mineral wool fire stop insulation or appropriately rated intumescent sealant.
   4. Fire-rating: as noted on drawings in accordance with NFPA 80, NFPA 252 or UL 10C, UL 1784 and NFPA 257.

5. Finish: Powder coating finish complying with AAMA 2603. Color to be selected from full range of manufacturer's colors.
6. Glazing accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant glazing tape. The SuperLite™ glazing panel shall be caulked continuously around the edge to the tube steel frame utilizing neutral cure silicone.
7. Fasteners: Type and size recommended by manufacturer.

E. Fire Resistive Glass Door: GPX Builder Series Temperature Rise fire rated doors by Safti-First products or accepted equal.
1. Material: 16 gauge smooth cold rolled steel.
2. Width: 2 ½".
3. Weight: 12 lb/lin. ft.
4. Fire-rating: as indicated on the door schedule, in accordance with NFPA 80, NFPA 252 or UL 10C, UL 1784 and NFPA 257.

G. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam with adhesive on two sides.

H. Silicone Sealant: 795 Silicone Building Sealant by Dow Corning or accepted equal. One-part neutral curing silicone.

I. Setting Blocks: Hardwood or calcium silicate, thickness of glass by 4 inches by 3/16" thick.

J. Spacers: Neoprene or other resilient blocks, adhesive backed on one face.

K. Cleaners, Primers and Sealers: Type recommended by manufacturer of glass and gaskets.

2.2 Door Hardware: Factory prep all doors and frames, and provide the following hardware at each referenced location. Refer to Section 087100 2.1A for manufacturers of products listed.

GROUP 1C (Storeroom Function, Rated, Access Control)
Doors 010, 019: Door leafs per Section 081416, Frame per this section

EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Wall Bumper	406 x 612

GROUP 1D (Storeroom Function, Rated, Access Control, Automatic Operator)
Door 004: Door leaf per Section 081416, Frame per this section

EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Elec. Lockset	70 x M1 x 10G271 x IPS-03 x LP x US26D with built-in RX

1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Auto. Door Opener	5700 x 689
1 Proximity Reader	RP15
1 Wall Bumper	406 x 612

Group 1D Door Operation:
General Building Occupants: Proximity readers located on the corridor of door will be programmed to unlock door.
Building Occupants Accessibility Limitations: Proximity readers located on both sides of the door will be programmed to unlock the door then activate the automatic door opener..

GROUP 8A **(Exit Device, Stair, Passage, Rated)**
Doors S3-1, S3-2, S3-3, S3-4

EACH TO HAVE:

3 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Exit Device	8815 x ETP x US26D
1 Door Closer	5100 x ALM x HD x FC
1 Hold Open	994
1 Wall Bumper	406 x 612
1 Kick plate	K1050F x 12" x 2" LWD x US26D (push side)
1 Auto Door Bottom	420APKL by Pemko
1 Hold Open	994

GROUP 8 **(Exit Device, Stair, Passage, Rated)**
Door S3-1A

EACH TO HAVE:

3 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Exit Device	8815 x ETP x US26D
1 Door Closer	5100 x ALM x HD x FC
1 Wall Bumper	406 x 612
1 Kick plate	K1050F x 12" x 2" LWD x US26D (push side)

GROUP 9 **(Storeroom Function, Rated, Access Control)**
Door 115C

EACH TO HAVE:

2 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
1 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
1 Exit Device	70 x M1 x 8874 x IPS-03 x ETP x US32D with built-in RX
1 Door Contact	(provided with electric lockset)
Power Connectors	(1) QC-C1500 @ frame, (1) QC-CXXXP @ door, add'l units as required to complete connections for functionality
1 Door Closer	5100 x ALM x HD x FC
1 Overhead Stop	1548S
1 Auto Door Bottom	420APKL by Pemko

GROUP 9A **(Storeroom Function, Rated, Access Control, Double Door)**
Door 115

EACH TO HAVE:

4 Hinge	TA2314 x 4 ½" x 4 ½" x US26D
2 Elec. Hinge	TA2314-QC12 x 4 ½" x 4 ½" x US26D
2 Exit Device	70 x M1 x NB8706 x ETP x US26D with built-in RX
2 Door Contact	(provided with electric lockset)
Power Connectors	(2) QC-C1500 @ frame, (2) QC-CXXXP @ door, add'l units as required to complete connections for functionality
2 Door Closer	5100 x ALM x HD x FC
2 Overhead Stop	1548S
2 Auto Door Bottom	420APKL by Pemko

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surface and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 FRAMING INSTALLATION

A. Install fire protection framing in conformance with the manufacturer's written recommendations and shop drawings.

B. Check that openings are plumb and square. Allow for an edge tolerance of 3/8". shim space at sides and head.

C. Install plumb and true. Limit to 1/8" in 10 feet in all dimensions.

D. Firmly packed perimeter of framing system to rough opening with mineral wool insulation and cap with intumescent sealant.

3.3 GLAZING INSTALLATION

A. Comply with referenced FGMA glazing manual and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during installation and handling. Inspect glass during installation and set aside pieces with edge damage that could affect performance.

C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corner. Provide minimum 3/16" edge clearance.

F. Glaze vertically into labeled doors or framing with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

G. Place glazing tape along free perimeter of glazing in same manner as described above.

H. Do not remove protective edge tape.

I. Install removable stop and secure without displacing tape or glazing compound. Do not pressure glaze.

J. Knife trim protruding tape.

K. Apply cap bead of silicone sealant along void between glass stop and glazing, to uniform line, and bevel to form watershed away from glass. Tool or wipe surface smooth.

L. Install so that appropriate markings remain visible.

3.4 CLEANING AND PROTECTION

A. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations.

C. Remove and replace glass which is scratched, broken, chipped, cracked, abraded or damaged in other ways during construction period.

D. Clean both faces in conformance with manufacture's recommendations.

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SECTION 089100
METAL LOUVER GATE

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Metal Louver Gate.

1.2 REFERENCES

A. Underwriters Laboratory Gate Operator Requirements (UL 325).

B. ASTM F 1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates, Type II, Class 2.

C. American Welding Society AWS D1.2 Structural Welding Code. See 2.01 D and 2.03 D.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, specifications and installation instructions for operator, fence support, accessories and fabric.

B. Shop Drawings: Submit shop drawings showing operator, fence layout and details.

C. Quality Assurance:

   1. All welds on the gate frame shall conform to Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 Structural Welding Code. All individual welders shall be certified to AWS D1.2 welding code. See 1.03 D.3.

D. Certifications:
   1. The aluminum welders and welding process must be certified.
   2. Manufacturer shall supply gate design performance certification.

E. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path

as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Louver Gate: Custom Louvered Gate by Jerith Duraweld Metalworks Ponte Vedra Beach, FL 32082 www.duraweldmetalworks.com or accepted equal.

1. Metal louver infill panels: AirFoil Grille Louvers with 3" grille spacing at 45° angle by Airolite or accepted equal. The louvers shall be 3-1/2" deep and assembled completely by welding. Blades and frames shall be 12 gauge (.081") extruded aluminum alloy 6063-T52. Provide Kynar 500-XL factory finished coating in manufacturer's standard or custom color to match mica champagne metallic with dry film thickness not less than 1.5 mils.
2. Height**:** 6'-0"
3. Finish: Powder coated finish.
4. Color: Mica champagne metallic.
5. Frame shall be an aluminum tube alloy 6063 T52. The wall shall be ¼" thick on the hinge legs of the frame and 1/8" thick the balance of the frame. The number of rails used in a section shall vary with the height, style, depth of louver infill panel and strength of the gate as determined by the manufacturer.
6. Panels shall be vented back rigid aluminum alloy 6063 T6 louver sections welded to frame.
7. Cane bolt drop rods shall be 3/4" galvanized steel round bar with welded stop and angle guides.
8. Gate hardware shall include a galvanized lockable hasp at locations shown on drawings, operable form each side of gate. Owner shall provide padlock.
9. Hinges: As shown on drawings and as follows:
   a. Piano Hinge: Manufacturers standard full length piano hinge to accommodate weight of gate and wind loads, US32D finish.
   b. Block Hinge: Manufacturers standard block hinge to accommodate weight of gate and wind loads, US32D finish.
10. All fasteners shall be stainless steel.
11. All post caps and hardware shall be cast aluminum. All latches shall be zinc castings.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Final grades and installation conditions shall be examined. Installation shall not begin until all unsatisfactory conditions are corrected.

B. Equipment in this section shall be installed in strict accordance with the company's printed instructions unless otherwise shown on the contract drawings.

3.2 SYSTEM VALIDATION:

A. The complete system shall be adjusted to assure it is performing properly.

B. The system shall be operated for a sufficient period of time to determine that the system is in proper working order.

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SECTION 092100
GYPSUM DRYWALL

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
1. Metal framing and support systems for interior partitions and ceilings.
2. Gypsum board and accessories.
3. Cementitious backer board and accessories

1.2 QUALITY ASSURANCE

A. Standards: Comply with the latest edition of the following:
1. Gypsum Association GA-201, Using Gypsum Board for Walls and Ceilings.
2. Gypsum Association GA-216, Recommended Specifications for the Application and Finishing of Gypsum Board.
3. Gypsum Association GA-220, Special Recommendations for Covering Existing Interior Walls and Ceilings with Gypsum Board.
4. Gypsum Association GA-600, Fire Resistance Design Manual.
5. Gypsum Association Recommended Specification: Levels of Gypsum Board Finish.
6. United States Gypsum, Gypsum Construction Handbook.
7. ASTM C840: Standard Specifications for Application and Finish of Gypsum Board.
8. ASTM C645: Standard Specification for Nonstructural Steel Framing Members.
9. ASTM C754: Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board or Water-Resistant Backing Board.

B. Fire Resistance Ratings: Provide fire-resistance-rated assemblies identical to those indicated by reference to GA-600 "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of other testing agencies in accordance with ASTM E119 acceptable to authorities having jurisdiction.

C. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

D. Drywall Recycling: All new paper-faced gypsum wallboard scrap (cuts from construction but not demolition waste) shall be recycled by Gypsum Recycling America LLC or approved equal.

E. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area perpendicular to exterior window to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install mockups for the following:
a. Each level of gypsum board finish indicated for use in exposed locations.
b. Spray Ceiling Finish.
2. Apply or install final decoration indicated, including painting, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product information for each gypsum drywall component.

B. LEED Submittal:
   1. Product Data for Credit MR 2: Building Product Disclosure and Optimization - Provide Type III Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113. Excludes products fabricated from rigid PVC or CPVC plastic.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Documentation for Credit MR 4: Construction and Demolition Waste Management: Include a statement indicating percentage of materials diverted from disposal in landfills and incinerators, and where recyclable resources are directed back to the manufacturing process.

1.4 JOB CONDITIONS

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer.

B. Store materials inside under cover to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage. Neatly stack gypsum boards flat to prevent sagging.

C. Environmental Requirements: Comply with referenced standards and recommendations of gypsum board manufacturer before, during and after application of gypsum board.

D. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during hot, dry weather to prevent too-rapid drying.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wall Support Framing: ProStud Drywall Framing System by Dietrich or accepted equal.
   1. Studs: ASTM C645; hot dipped galvanized steel, shape and depth of section as noted on drawings and 20 gauge minimum thickness of base metal.
   2. Shaftwall Studs: ASTM C645, hot dipped galvanized steel, shape and depth of section as noted on drawings with 20 gauge thickness of base metal.
   3. Track and Deflection Track: Match wall studs as stud manufacturer recommends for floor and ceiling support of studs.
   4. Resilient Channels: Single leg RC-1 channels, 1/2", 25 gauge, hot dipped galvanized steel.
   5. Furring Channels: ASTM C645, hot dipped galvanized steel, hat shaped, 7/8" or 1-1/2" as noted on Drawings, 25 gauge unless otherwise noted.
   6. Z-Furring Channels: ASTM C645, hot dipped galvanized steel, depth of section as noted on drawings, 25 gauge minimum thickness of base metal.
   7. Top Track at rated partitions: Dietrich BlazeFrame DL-2, 20 gauge, with 2" leg, UL head detail HW-D-0498 and U419 wall assembly.
   8. Fasteners and Accessories: Type and size recommended by manufacturer for the substrate and application indicated or as noted below.
      a. 3/16" diameter self-tapping anchors at masonry, minimum 16" on center.
      b. #12 self-tapping screws at steel, minimum 16" on center.

B. Ceiling Support Framing: 640 Drywall Furring System by Chicago Metallic or accepted equal. Provide screws, clips, bolts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for intended use has been proven through standard construction practices or by certified test data.

C. Gypsum Board: Type as noted below by United States Gypsum Company or accepted equal. Provide tapered edges, maximum lengths to minimize joints and thickness as noted on Drawings.
   1. Gypsum Wallboard (Walls and Fire rated Ceilings): USG Ecosmart Interior Panels, Firecode X ASTM C1396, Type X gypsum board, 5/8" thick.
   2. Gypsum Wallboard (Inner layer of multi-layer Walls and Fire rated Ceilings): Firecode Core C Interior panels, ASTM C1396, Type X gypsum board, 5/8" thick.
   3. Gypsum Wallboard (Non- rated Ceilings and Soffits): ASTM C36, Regular gypsum board, 5/8" thick.
   4. Water Resistant Gypsum Backing Board (Walls and Ceilings in Bathroom and Toilet rooms): 5/8" Eco smart Panels Mold Tough FireCode XI (Use Type X where noted).
   5. Gypsum Liner Panel: ASTM C442, 1" thick, beveled edge.

D. Cementitous Backer Board: 1/4" & 1/2" Durock by United States Gypsum or accepted equal.

E. Trim Accessories
   1. Cornerbead: Dur-A-Bead1-1/4" x 1-1/4", galvanized steel by USG or accepted equal.
   2. Edge Trim: Sheet Rock Metal Trim #402, 1-1/4" flange, galvanized steel by USG or accepted equal.
   3. Tapable Edge Trim: #200-A (J-bead), 7/8" flange, galvanized steel by USG or accepted equal. Thickness as required.
   4. Control Joint: Control Joint #093 perforated face flanges connected by V-shaped slot, 1/4" wide covered with removable tape by USG or accepted equal.

F. Finish Systems Materials: ASTM C475, type as recommended by manufacturer for application indicated.
   1. Joint Tape (Gypsum Board): Perforated paper reinforcing tape.
   2. Joint Tape (Gypsum Backer Board):
      a. 2" wide 10 x 10 glass mesh tape.
      b. Reinforcing fabric: Balanced, alkali-resistant, open-weave, glass fiber fabric, made from continuous multi-end strands with tensile strength of not less than 120 lbs. and 140 lbs. in warp and fill directions, respectively, per ASTM D 1682 and complying with ASTM D 578, and of 4.30 oz./sq. yd. minimum weight.
   3. Joint Compound (Drying Type): Ready mixed vinyl type all purpose joint compound for general taping and topping.
   4. Joint Compound (Setting Type): Factory prepackaged, job mixed, chemical hardening compound as recommended by manufacturer for water resistant gypsum backing board and special patching and filling situations, including fireproofing penetrations in fire-rated partitions.
   5. Firestop Compound: Thermafiber Smoke Seal Compound by United States Gypsum Company or accepted equal. Provide accessory mineral fiber insulation and accessories as recommended by firestop sealant manufacturer.

G. Acrylic Textured Ceiling Finish (Bottom of exposed concrete slab, all locations):
   1. Primer as recommended by Toughtex or accepted equal).
   2. Type II Toughtex Acrylic knockdown, as manufactured by Coranado, satin finish.

H. Laminating Adhesive: Special adhesive specifically recommended for laminating gypsum boards as recommended by gypsum board manufacturer.

I. Screws: ASTM C1002
   1. Type S: For gypsum board to light gauge steel framing.
   2. Type G: For gypsum board to gypsum board.
   3. Type W: For gypsum board to wood framing.

J. Acoustical Sealant: Paintable, nonstaining, latex sealant complying with ASTM C834.

K. Acoustic/Mineral Fiber Insulation: 3" Thermafiber Sound Attenuation Fire Blankets by Owens Corning or accepted equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which work is to be installed. Do not proceed with the work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Wall/Partition Support Systems
   1. Comply with ASTM C754, ASTM C840 and manufacturer's recommendations.
   2. Install runner tracks at floor, ceilings and structural walls, columns and where drywall stud system abuts other work.
   3. Isolate stud system from transfer of structural loading to system vertically. Provide deflection track to attain lateral support and avoid axial loading. Install fire rated deflection track where noted in fire rated partitions.
   4. Install each steel framing and furring member so that fastening surface does not vary more than 1/8" from plane of faces of adjacent framing.

5. Extend partition framing full height to structural supports or substrates above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
6. Space studs and wall furring members 16" on center, unless otherwise indicated.
7. Frame door openings to comply with details indicated; if not otherwise indicated, comply with applicable published recommendations of gypsum board manufacturer or Gypsum Association.
8. Frame other openings to comply with details indicated or if not indicated, in same manner as required for door openings. Install framing below sills of openings to match framing required above door heads.
9. Install firestop blocking between studs at line of ceiling intersection at all locations.
10. Install supplementary wood framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, cabinetry, shelving and similar work to comply with details indicated.

B. Ceiling Support Suspension Systems
1. Comply with ASTM C754, ASTM C840 and manufacturer's recommendations.
2. Connect directly to structure where possible; otherwise connect to inserts, clips or other anchorage devices or fasteners as indicated.
3. Space main runners 4'-0" on center along runners, except as otherwise shown.
4. Level main runners to tolerance of 1/8" in 12'-0", measured lengthwise on each runner and transversely between parallel runners.
5. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
6. Attach perimeter wall track or angle wherever support system meets vertical surfaces. Mechanically join support members to wall track.
7. Space furring members 16" on center, except as otherwise indicated.
8. Install auxiliary framing at termination of drywall work and at openings for electrical and mechanical work, as required for support of both the dry wall construction and other work.

C. Gypsum Board - General Installation Requirements
1. Comply with referenced standards of Gypsum Association Underwriters Laboratory and ASTM C840.
2. Field verify all existing conditions and dimensions and cut gypsum board to fit, allowing for existing slab deflection of 1” or more between columns.
3. Allow for fire rated partition fire sealant installation.
4. Arrange boards in the direction and manner to minimize the number of end-butt joints. Locate any necessary exposed end-butt joints as far as possible from center of walls and ceilings and stagger not less than 1'-0" in alternate courses of board.
5. Install face side out, discarding imperfect, damaged or damp boards. Butt boards together for a light contract at edges and ends with not more than 1/16" open space between boards. Do not force into place.
6. Locate edge and end joints over supports. Stagger vertical joints on opposite side of partitions.
7. Attach gypsum board to supplementary framing and blocking at openings and cutouts.
8. Cover both faces of partition framing with gypsum board in concealed spaces (above ceilings, chases, etc.) unless otherwise indicated.
9. Space fasteners for boards in accordance with referenced standards and manufacturer's recommendations.

10. Provide control joints in strict compliance with the manufacturers written instructions at spacing and locations recommended by the manufacturer. At a minimum, control joints must adhere to the following schedule:

Partitions and Walls	30 feet maximum, both directions;
Interior Ceilings without perimeter relief	30 feet maximum, both directions;
Interior Ceilings with perimeter relief	50 feet maximum, both directions.

11. In addition to the above schedule, provide control joints:
    a. where walls or ceilings or dissimilar construction meet in the same plane;
    b. where control or expansion joints occur in the building structure or in the base wall or ceiling construction; and
    c. at the junctions of "T", "L", and "U" shaped ceiling areas.

    Space the panels forming control joints 1/2" apart. In walls and partitions, use separate framing members for each side of control joints.
12. Gypsum Drywall Single-Layer Application: Fasten with screws.
    a. Ceilings: Apply before walls/partitions to the greatest extent possible.
    b. Partitions/walls 8'-1" or less in height: Apply board horizontally.
    c. Partitions/walls higher than 8'-1": Apply board either horizontally or vertically to minimize number of joints.
13. Gypsum Drywall Double Layer Application: Install gypsum board for base layer and for face layer.
    a. Ceilings: Apply base layer prior to application on walls/partitions and at right angles to supports unless otherwise indicated. Apply face layers in same sequence, offsetting joints between layers at least 10".
    b. Partitions/Walls: Apply base layer and face layers vertically (parallel) with joints over supports; offset joints between layers at least 16". Fasten base and face layers to supports separately with screws or fasten base layers with screws and face layer with adhesive and supplementary fasteners.

D. Installation of Cementitious Backer Board
1. Install in accordance with manufacturer's recommendations and TCA Handbook for Ceramic Tile Installation.
2. Fasten board at 6" on center with screws as recommended by manufacturer firmly anchored to stud backup.
3. Apply glass mesh joint tape over joints. Embed tape in setting material indicated for specified tile finishes. Allow joints to dry prior to installing tile systems.

E. Installation of Drywall Trim Accessories
1. General: Use the same fasteners, where feasible, to anchor trim flanges as used to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
2. External Corners: Install metal corner beads.
    a. Exposed or semi-exposed edges of boards: Install metal edge trim, ***tapeable*** J-type, where work is tightly abutted to other work.

F. Finishing of Drywall
1. General: Treat gypsum board joints, flanges of trim accessories, penetrations, fasteners heads, surface defects and elsewhere as required to provide smooth surfaces for decoration in compliance with Gypsum Association's Recommended Specification for a Level 4 Finish except provide Level 5 Finish at all bedroom, suite lounge and corridor walls that are perpendicular to exterior windows or doors and severe lighting conditions as defined in this publication.
2. Prefill open joints and rounded or beveled edges, if any, using type of compound recommended by manufacturer.

3. Tape joints between gypsum boards.
4. Apply joint compound in a minimum of three coats. Sand between coats and after last coat to allow acceptance of finishes.
5. Touch up all surface imperfections as directed by Architect.
6. Where acoustical insulation is indicated within gypsum board assemblies, seal construction at perimeters, behind control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C919 and manufacturer's recommendations for location of edge trim and closing off sound-flaking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
7. Where pipe, conduit or duct work penetrate fir/smoke barrier partitions, all gaps around the penetration are to be filled with joint compound in conformance with UL requirements. Where not exposed to view, finish to comply with the Gypsum Associations' Recommended Specification for a Level 1 Finish.

G. Concrete Ceiling Finish Installation
1. Remove all fasteners, wire, and equipment from underside of concrete slabs.
2. Grind down ridges and level and unevenness in concrete substrate to provide a smooth substrate. Remove all dirt, oil grease or any loose or water soluble material.
3. Infill electric work boxes with grout at all removed lighting and electrical devices removed from underside of concrete slab.
4. Durabond skim coat to fill, cover all imperfections and damage caused by asbestos abatement and electric removals.
5. Apply one coat of primer over entire surface and allow to dry.
6. Apply spray finish in conformance with manufacturer's recommendations and coverage rate to match approved sample.
7. Spray apply material to blend uniformly and cover fully without starved spots or other evidence of thin application. Provide uniform texture without application patterns.
8. Remove any texture droppings or overspray from walls and other surfaces. Leave room broom clean.

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SECTION 093013
TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Ceramic tile.
   2. Porcelain tile.
   3. Marble thresholds.

1.2 QUALITY ASSURANCE

A. Standards: Comply with material and installation standards of the Tile Council of America, Inc. (TCA) and American National Standards Institute (ANSI).

B. Obtain each category of materials from a single source.
   1. Each type of tile.
   2. Grout, setting materials and admixtures.
   3. Accessories.

1.3 SUBMITTALS

A. Products Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.

B. Samples
   1. Manufacturer's color samples consisting of actual tiles or section of tiles showing full range of colors, textures and patterns available for each type of tile indicated.
   2. Samples of grout and accessories involving color selection.
   3. Tile: One full size sample representative of color range selected.

C. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk

programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Product Handling
   1. Deliver and store packaged materials in original containers with seals unbroken and labels intact until tile is used.
   2. Prevent damage or contamination to materials by water, freezing, foreign matter or other cause.

B. Project Conditions
   1. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
   2. Maintain temperatures at not less that 50^{O}F (10^{O}C) in tiled areas during installation and for seven days after completion, unless higher temperatures required by referenced installation standard or manufacturer's instructions.

1.5 EXTRA STOCK

A. Extra Materials: Furnish 2% of each tile and trim used in original cartons to Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Porcelain Tile: 6” x 24”, Captivate by Creative Materials Corp. or accepted equal.
   1. Color A: Light Grey.
   2. Color B: Amber

B. Porcelain Tile Base: 6” x 24”, Captivate by Creative Materials Corp. or accepted equal. Color: Light Grey or Amber to match adjacent floor tile. Cut to fit.

C. Porcelain Tile Base at Stairs: 6” x 24” Captivate by Creative Materials Corp. or accepted equal. Color: Light Grey. Cut to fit.

D. Ceramic Tile Type 1 (Wall): 4” x 12”, Slide by Creative Materials Corp. or accepted equal. Color: White.

E. Ceramic Tile Type 2 (Wall): 3” x 12”, Effervescent by Creative Materials Corp. or accepted equal.
   1. Color A: White.
   2. Color B: Taupe.

F. Trim:
   1. Stair Nosing: TREP-S Stair nosing by the Schluter Company or accepted equal. Color to be selected by architect.
   2. Edge Protection (Type 1): RENO-U by the Schluter Company or accepted equal. Color to be selected by architect.

3. Edge Protection (Type 2): RENO-V Schiene at radius walls, – Radius by Schulter Company or accepted equal.
4. Wall Base Cap: Schiene by Schluter Company or equal.
5. Expansion Joint: DILEX –AKWS movement joint profiles by the Schluter Company or accepted equal. Color to be selected by architect.
6. Trim Vertical Corner Joint: QUADEC profiles by the Schluter Company or accepted equal. Provide color coated aluminum trim. Color to be selected by architect.

G. Marble Thresholds: Provide marble thresholds complying with ASTM C503 requirements for exterior use and abrasion resistance for uses subject to heavy foot traffic. Provide grey honed marble complying with MIA Group "A" requirements for soundness.

H. Latex-Portland Mortar: Prepackaged latex Portland cement mortar – ANSI A118.4.

I. Dry Set Mortar: Prepackaged dry-set mortar – ANSI 118.1.

J. Latex-Portland Grout: Prepackaged latex Portland cement grout – ANSI A118.7 type, with color additive.

K. Epoxy Grout: Prepackaged epoxy grout - ANSI A118.3 with color additive.

L. Waterproof Membrane: Ditra by the Schulter Company or accepted equal. Provide Kerdi-Band waterproof stripping at all penetrations, joints and at wall/floor junctures including preformed inside and outside corners and preformed pipe collars for elements that penetrate the waterproof membrane.

M. Tile Sealant
1. Walls: Sanitary 1700 Sealant by General Electric or accepted equal. One part mildew resistant silicone sealant. Color as selected by Architect.
2. Floors: Chem-Calk 500 by Bostik Construction Products or accepted equal. Multipart pourable urethane sealant for traffic grade usage. Color as selected by Architect.

N. Tile Cleaner: Product specifically acceptable to tile and grout manufacturer.

O. Grout Sealer: Sealers Choice by Aqua Mix or accepted equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surface to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standards.

3.2 PREPARATION

A. Waterproof Membrane Installation for Thinset Application
1. Assure dry substrate before sheet waterproofing installation and vacuum clean surface to remove all contaminants.

2. Apply waterproofing membrane in conformance with manufacturer's recommendations. Provide waterproof stripping at all membrane joints, penetrations, drains and at floor/wall intersections.
3. Carry waterproof stripping up walls a minimum of 8 inches.
4. Flood test area and make necessary corrections to stop all leakage.

B. Cementitious Backer Board
1. Verify board fastening at 8 inches on center with screws firmly anchored into stud backing.
2. All horizontal and vertical joints and corners are to have a 1/8 inch spacing to be filled solid with dry set mortar. Apply 2 inch glass fiber mesh tape embedded in a skim coat of the dry-set mortar at all joints and corners.

C. Expansion Joints: Notify Architect if concrete slab expansion joints are located within work areas. Install tile at expansion joints in conformance with TCA EJ171 and manufacturer's recommendations.

3.3 TILE INSTALLATION

A. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with the following TCA installation methods.
1. Lobby, Entry Vestibules, and Toilet Room Floors: F128-12 (Thinset with waterproof membrane).
2. Toilet Room Walls: W243 (Thinset over GWB).
3. Bathroom and Shower Room Walls: W244 (Thinset over cement board with waterproof membrane).
4. Entry Vestibule over Radiant Heat: RH110-12.

B. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars or covers overlap tile.

D. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.

E. Install all wall base with Schluter wall base cap top of tile wall base.

F. Sealant: Seal juncture of plumbing fixtures, exposed pipe penetrations, fittings and expansion joints with sealant after grouting.

G. Grout Sealer: Install sealer according to manufacturer's recommendations. Apply 48 hours after grout installation, when tile is clean and dry. Install two coats, polish dry, removing excess.

3.4 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter in accordance with tile and grout manufacturer's printed instructions. Protect adjacent surfaces from effects of cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbounded, or otherwise defective tile work.

C. Protection: Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.

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SECTION 095100
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
   1. Acoustical ceilings with exposed grid suspension system.

1.2 QUALITY ASSURANCE

A. Installer shall be thoroughly experienced with acoustic ceilings installation similar in material, design and extent.

B. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with ASTM E1264 for Class A products.
   2. Flame Spread: 25 or less.
   3. Smoke Developed: 50 or less.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required and for each suspension system, including certified laboratory test reports and other data required to show compliance with these specifications.

B. Samples: Submit samples for verification purposes.
   1. Set of 4" x 6" square samples for each acoustical tile required, showing full range of exposed color and texture to be expected in completed work.
   2. Set of 12" long samples of each exposed runner and molding type.

C. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path

as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components and partition system.

B. Do not install acoustic ceiling until installation areas meet the following requirements: mechanical, electrical and other work above ceiling has been completed; wet work has been installed; temperature and relative humidity have reached levels which comply with acoustic material manufacturer's recommendations for the units to be used in the work and are acceptable to the installer.

C. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage.

D. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content ambient during installation and anticipated for occupancy.

1.5 EXTRA STOCK

A. Extra Materials: Furnish the Owner with extra acoustic ceiling panels equal to 2% of the amount installed or 50 tiles, whichever is greater, in original protective covering for each ceiling system.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acoustical Ceiling System
   1. Suspension System: Prelude, 15/16” exposed tee grid by Armstrong or accepted equal. Color: White.
   2. Acoustic Tile: Fine Fissured High NRC Lay in tile, 24” x 24” x 7/8”, white, with 9/16” beveled tegular edge by Armstrong or accepted equal.
   3. Hold Down Clip: Provide manufacturer’s recommended unit.

B. Accessories: Hanger wire, fasteners, anchors and all accessories as recommended by manufacturer for a complete installation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which the work is to be installed. Do not proceed with the work until all unsatisfactory conditions are corrected.

3.2 GENERAL

A. Install materials in accordance with manufacturer's printed instructions and industry standards applicable to work.

3.3 SUSPENSION SYSTEM INSTALLATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders. Comply with reflected ceiling plans.

B. Install suspension systems to comply with ASTM C636, with hangers supported only from building structural members. Locate hangers not less than 6" from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".

C. Install hangers plumb and free from contact with other objects within ceiling. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying or other equally effective means.

D. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews or other devices that are secure and appropriate for substrate and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion or elevated temperatures.

3.4 ACOUSTIC PANEL INSTALLATION

A. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders of penetrations.

B. Install hold down clips in all ceilings less than 8’-0” a.f.f.

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SECTION 095400
SPECIALTY CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Linear acoustic metal ceiling.

1.2 QUALITY ASSURANCE

A. Installer shall be thoroughly experienced with linear ceilings installation similar in material, design and extent.

B. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with ASTM E1264 for Class A products.
   2. Flame Spread: 25 or less.
   3. Smoke Developed: 50 or less.

1.3 SUBMITTALS

A. Product Data: Catalog sheets, specifications and installation instructions.

B. Shop Drawings: Reflected ceiling plans and details that show specific application to the work. Indicate location of supports, panels, removable panels, access panels and other items that are part of built-in with or coordinated with the ceiling system, including items provided under separate contracts.
   1. Show fabrication details including connection to adjacent work, edge details, joint details and perimeter trim.
   2. Include job specific details for installation of HVAC, lighting and fire protection devices.

C. Samples
   1. Ceiling Support System: 12" long, full section each component.
   2. Panels: 12" square showing end and edge construction, with acoustical fill and front and back panels in place.
   3. Color Samples: Manufacturer's standard colors for finish specified.
   4. Fasteners and Anchors: 5 each type and size.

D. Quality Control Submittals
   1. Test Reports: Acoustic laboratory test reports for sound absorption (NRC) and sound transmission (STC).
   2. Certificates: Affidavit required under Quality Assurance Article.

E. LEED Submittal:

1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Coordinate layout and installation of linear ceiling units and suspension system components with other work supported by or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components and partition system.

B. Do not install linear ceiling until installation areas meet the following requirements: exterior openings have been closed and roofs are weathertight; complete cleaning of the areas above the new ceiling line has been completed; mechanical, electrical and other work above ceiling has been completed; wet work has been installed; temperature and relative humidity have reached levels which comply with acoustic material manufacturer's recommendations for the units to be used in the work and are acceptable to the installer.

C. Deliver linear ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage.

D. Before installing linear ceiling units, permit them to reach room temperature and a stabilized moisture content ambient during installation and anticipated for occupancy.

1.5 EXTRA STOCK

A. Furnish 10 extra panels of each type matching the installed panels. Individually protect each panel. Label the panels to indicate the locations used and store them at the Site where directed by the Construction Manager.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Interior Linear Acoustic Ceiling System (LAC):
   1. Basis of Design: Box Series by Hunter Douglas, or approved equal.
      a. Substrate: Aluminum.
      b. Panel Module Width: 6”
      c. Color/Finish: Decorated wood-look powder coat 8446 Clipper Teak.
      d. Filler Strip: Box Flat Recessed Closure, matte black, #1883.
      e. Perforation Pattern: #124 perforated.
      f. Acoustical Backer: Non Woven, black.
      g. Trim: Wall Angle and LX04 Edgeline Trim.
      h. Exposure: Interior.

B. Exterior Linear Acoustic Ceiling System
   1. Basis of Design: Box Series by Hunter Douglas, or approved equal.
      a. Substrate: Aluminum.
      b. Panel Module Width: 6”
      c. Color/Finish: Decorated wood-look powder coat 8446 Clipper Teak.
      d. Filler Strip: Box Flat Recessed Closure, matte black, #1883.
      e. Trim: Wall Angle.
      f. Exposure: Exterior.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the substrate and conditions under which the work is to be installed. Do not proceed with the work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install the work of this Section in accordance with ceiling system manufacturer's printed instructions, except as otherwise indicated or specified.

B. Tolerances
   1. Maximum Deflection of Suspension System with Full Dead Load: L/360 of span.
   2. Finish Ceiling Surface: True within 1/8" per 10 feet.

3.3 CLEANING

A. After completion of the ceiling system clean exposed surfaces to remove dirt and residue.

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SECTION 096500
RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Vinyl composition tile.
   2. Linoleum.
   3. Rubber floor system.
   4. Rubber base.

1.2 QUALITY ASSURANCE

A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants and leveling compounds.

B. Mock Up: The contractor shall provide a mock up for review by the architect and manufacturer's representative prior to any installation. Mock up will be provided in a room that is part of the project. For linoleum installations, the manufacturer's representative shall observe the installation of the mock up to ensure proper installation procedures are being followed. Approval is required prior to proceeding with installation.

C. Installer Qualifications:
   1. Contractor and Installers shall provide proof that they have completed at least three (3) projects of similar magnitude, material, and complexity.
   2. A manufacturer's certified installer shall be present fulltime at the jobsite each day that resilient flooring work occurs.

1.3 SUBMITTALS

A. Product Data: Submit two copies of manufacturer's technical data and installation instructions for each type of resilient flooring and accessory.

B. Shop Drawings: Submit linoleum seaming diagram and details of special patterns for approval.

C. Installer Certificates: Submit installer certification signed by manufacturer certifying that installers comply with specified requirements.

D. Samples: Submit samples of each type, color and pattern of resilient flooring, base and accessories required indicating full range of color and pattern variation.

E. Maintenance Instructions: Submit three copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

F. Test Results: Submit results of moisture testing and pH testing.

G. LEED Submittals

1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Maintain minimum temperature of 65°F in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation and for not less than 48 hours after installation. Store resilient flooring material in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain temperature of 55°F in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended pH and moisture tests.

1.5 EXTRA STOCK

A. Extra Materials: Furnish 2 extra boxes of tile for each 3,000 square feet (or fraction thereof) of each type and color of tile installed. The extra tile shall be from the same run and lot number as the installed tile.

1.6 PRE-INSTALLATION CONFERENCE

A. A pre-installation conference shall be held prior to the installation of flooring materials. Attendees shall include at a minimum the following: the Contractor, the installer for each material and system to be installed, the testing agent for the tests specified in 3.1-C, DASNY, Owner's representative and the Architect. Topics to be discussed include, but are not limited to, the following:
   1. Slab preparation and acceptance,
   2. Testing as specified in 3.1-C,

3. Moisture mitigation membrane installation, and
4. Flooring installation methods.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vinyl Composition Tile: 12” x 24” Striations BioBased Tile by Armstrong or accepted equal. Color selection by the Architect from full range of manufacturer’s colors.

B. Linoleum Tile (Alternate as per 012300): 13” x 13” (2. mm) gauge Marmoleum Composition Tile by Forbo Industries Inc. or accepted equal. Color to be selected by Architect.
1. Finish: TopShield 2 high performance finish.
2. Adhesive: Forbo Sustain 885m as recommended by manufacturer.
3. Sealant at Adjacent Surfaces and Penetrations: Waterproof type as recommended by manufacturer.
4. Installation pattern to be ¼ turned.

C. Rubber Floor System: BMRTS, Bamboo Texture by Johnsonite or accepted equal. Color: As selected by Architect from standard colors.
1. Stair One-piece Tread/Riser Combination: VIBMRTS with a 2” wide contrasting solid rubber color insert strip (Insert color: 40 black) at the nose of the tread, tapering thickness gauge of .210" to .113" across the 13” tread depth and with a 7” integral riser, with depth of 2” square nosing and hinged underside to accommodate various stair pan angles.
2. Landing Covering: Rubber Tile, 12" x 12" x 1/8" thick.

D. Vinyl Base: 4” Vinyl Base by Johnsonite or accepted equal. 4" high, 1/8" thick, matte finish vinyl with matching end stops. Provide toe (Location: Resilient Flooring) and toeless (Location: Carpet Flooring) type base. Color selection by the Architect.

E. Resilient Edge Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge by Roppe or accepted equal. Color as selected by Architect from standard colors.

F. Adhesives: Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions to and to comply with manufacturer’s warranty requirements and are compatible with moisture control system and concrete underlayment specified in Specification Section 035416.

G. Leveling Compound: Portland Cement based latex type as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Broom clean or vacuum surfaces to remove all dirt and debris and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.

B. Maintain reference markers, holes or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

C. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.

D. Perform bond and moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured, dried and ready to receive flooring.
   1. InSitu Moisture Testing: Test internal slab relative humidity in accordance with ASTM F 2170. Provide one test per 1,000 square feet of flooring (minimum of 3). The maximum relativity shall not exceed the manufacturer's requirements.
   2. pH Test: Use ph testing procedure acceptable to manufacturer to assure substrate characteristics are within acceptable alkali range.

E. Apply moisture control system specified in Specification Section 035416 to all slab on grade concrete floors prior to application of finished flooring. Apply in compliance with manufacturer's directions.

F. Apply Concrete Floor Underlayment on concrete suspended floor slabs and over moisture control system on slab on grade areas. See Specification Section 035416.

3.2 TILE INSTALLATION

A. Install flooring using method indicated in strict compliance with manufacturer's recommendations. Extend flooring into toe spaces, door reveals and into closets and similar openings.

B. Tightly cement flooring to substrate without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks or other surface imperfections. Hand roll flooring at perimeter of each covered area to assure adhesion.

C. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to comply with tile manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times

D. Tile Floors
   1. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile room axis, unless otherwise shown.
   2. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packages if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped or deformed tiles are not acceptable.
      a. Lay tile with patterns as directed by the Architect.
      b. Continue floor pattern through doorways or openings at adjacent rooms.
      c. Stop floor patterns beneath doors to adjacent rooms.

E. Linoleum tiles:
   1. The flooring material MUST always be placed into wet adhesive and rolled immediately. Check for adhesive transfer frequently. There must be a wet transfer of adhesive to the material backing in order to achieve a secure bond.

2. Use a 1/16" X 1/16" X 1/16" square notch trowel.
3. Spread Rate: Approximately 150 square feet/gallon.

F. Accessories: Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.3 CLEANING AND PROTECTION

A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer.

3.4 OWNER TRAINING

A. Linoleum flooring manufacturer's representative must be contacted prior to occupancy to establish facility-specific cleaning and maintenance program customized to facility's needs.

B. Train Owner's housekeeping personnel in the manufacturer's recommended cleaning and maintenance procedures for each flooring product specified.

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SECTION 096705
EPOXY FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Epoxy flooring.
   2. Waterproof membrane.
   3. Epoxy underlayments.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer or applicator who has a minimum of five years specialized in installing flooring types similar to that required for this Project and who is acceptable to manufacturer of primary materials.

B. Single-Source Responsibility: Obtain materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, application instructions and general recommendations for the flooring specified herein.

B. Color Selection Charts: Submit manufacturer's full color selection charts for initial selection purpose.

C. Samples: Submit 2-1/2" x 4" actual samples of selected colors as designated by the Architect for final selection purposes.

D. Moisture tests: Moisture vapor transmission test results taken on or within the concrete substrate per ASTM F1869 Standard Test Method for Determining Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride and ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs using in situ probes prior to placement of moisture mitigation primer.

E. LEED Submittals
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.

3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Comply with the flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect Work.

B. Lighting: Permanent lighting will be in place and working before installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Epoxy Flooring Type 1:
1. Epoxy Flooring: Stonshield HRI as manufactured by Stonhard, Inc., Maple Shade, NJ, (800)854-0310 or accepted equal. Provide a 3/16" thick flooring system comprised of a two-component epoxy primer, three-component mortar consisting of epoxy resin, curing agent and finely graded silica aggregate, three-component, epoxy undercoat, brightly colored, quartz silica aggregate broadcast and a high performance, two-component, clear epoxy sealer.
   a. Color: Gotham Gray.
   b. Texture: Medium
2. Waterproof Membrane: Stonproof ME7 as manufactured by Stonhard, Inc., Maple Shade, NJ, (800)854-0310 or accepted equal. Provide waterproof membrane at suspended slab locations.

B. Epoxy Flooring Type 2:
1. Epoxy Flooring: Stonkote GS4 as manufactured by Stonhard, Inc., Maple Shade, NJ, (800) 257-7953. Provide a 3/16" thick system. Provide a two-component, 100% solids, general service, epoxy coating and a selected, graded aggregate.
   a. Color: Desert Tan.
   b. Texture: Texture #2.

2. Mortar: Stonclad GS as manufactured by Stonhard, Inc., Maple Shade, NJ, (800) 257-7953. Provide moisture tolerant, two-component epoxy primer and a three-component mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments.

C. Epoxy Underlayment: Emaco R300 Cl as manufactured by BASF, The Chemical Company. Shakopee, MN, (800)243-6739 or accepted equal. Underlayment only to be used at Epoxy Flooring Types 1 and 2 locations to create pitch to floor drains.

D. Moisture Mitigation Primer: StonefilOP2 as manufactured by Stonhard, Inc., Maple Shade, NJ, (800)854-0310 or accepted equal. Provide moisture mitigation primer at slab-on-grade locations.

E. Sealant: MP7 by as manufactured by Stonhard, Inc., Maple Shade, NJ, (800)854-0310 or accepted equal. Color as selected by Architect.
1. VOC Content: Provide sealant that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
a. Architectural Sealants: 250 g/L.
b. Sealant Primers for Nonporous Substrates: 250 g/L.
c. Sealant Primers for Porous Substrates: 775 g/L.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 PREPARATION FOR CONCRETE SLAB-ON-GRADE AREAS

A. Conduct moisture vapor transmission test results taken on or within the concrete substrate per ASTM F1869 Standard Test Method for Determining Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride and ASTM F2170 Standard test Method for Determining Relative Humidity in Concrete Floor Slabs Using Insitu Probes prior to placement of moisture mitigation primer. Tests shall be conducted by an independent testing agency employed by the Owner. A minimum of three tests shall be conducted in each separate work area. Manufacturer shall provide written approval of test results as being acceptable for application of substrate primer as part of test result submission. Results of the testing shall not eliminate the use of the moisture mitigation primer.

B. Concrete Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved.

C. Scarify as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminates. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.

D. Use underlayment to create a 1/8" per foot pitch to floor drain and to provide a smooth substrate to eliminate telegraphing of imperfections thru finished flooring. See Drawings for location s of pitch floors.

E. Vacuum clean substrate of all dust and loose debris prior to application of moisture mitigation membrane primer.

F. Install moisture mitigation primer over slab on grade areas. Comply with manufacturer's instructions and recommendations for mixing and installing moisture mitigation primer.

G. Install waterproofing membrane to all suspended slab locations; carry waterproofing membrane 4" up walls.

3.3 EPOXY FLOORING TYPE 1 INSTALLATION

A. General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.

B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates.

C. Membrane: Mix and apply membrane over previously primed substrate with strict adherence to manufacturer's installation procedures and coverage rates.

D. Primer: Mix and apply primer with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between membrane and mortar.

E. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using stainless steel finishing trowels or power trowel material.

F. Integral cove base and wainscot: Stonshield Cove Base should be utilized for application of required cove base and wainscot on walls.

G. Undercoat: Remove any surface irregularities by lightly abrading and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates.

H. Broadcast: Immediately broadcast quartz silica aggregate into the undercoat using manufacturer's specially designed spraycaster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

I. Sealer: Remove excess unbonded granules by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

3.4 EPOXY FLOORING TYPE 2 INSTALLATION

A. General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.

B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate.

C. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using stainless steel finishing trowels.

D. Coating/Texture: Remove any surface imperfections by lightly abrading and vacuuming the floor surface. Mix coating and texture according to manufacturer's recommended procedures. Squeegee apply and backroll textured coating with strict adherence to manufacturer's installation procedures and coverage rates.

3.5 CURING AND PROTECTION

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

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SECTION 096800
CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
   1. Carpet.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Firm with not less than 3 years of experience in installation of carpeting similar to that required for this project.

B. Standards: Refer to current edition of "Carpet Specifier's Handbook" by The Carpet and Rug Institute.

C. Flame/Smoke Resistance Standards: Provide materials complying with ratings as indicated for the following test standards.
   1. Floor Radiant Panel Test: Test for burning under varying radiant energy levels; ASTM E648, with minimum average radiant flux ratings meeting NFPA Class 1 rating with a critical radiant flux of 0.45 watts per square centimeter.
   2. Smoke Density Test: Test in radiant heat chamber, with and without flame, for density of smoke generated; ASTM E662 or NFPA No. 258, also known as NBS Smoke Density Chamber Test. Provide rating of 450 or less.
   3. Carpet Flammability: All carpet must pass Flammable Fabrics Act DOC FF 1-70 criteria.

1.3 SUBMITTALS

A. Product Data: Manufacturer's complete technical product data for each type of carpet, cushion and accessory item required.

B. Samples
   1. Manufacturer's standard samples of each carpet type required.
   2. 6" long samples of each type exposed edge guard.

C. Maintenance Data: Submit manufacturer's printed maintenance recommendations, including methods and frequency recommended for maintaining carpet in optimum condition under anticipated traffic and use conditions.

D. Shop Drawings: Layout and seaming diagrams for carpet including installation details at special conditions.

E. LEED Submittal
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility

b. Bio-Based Materials
c. Wood products certified by FSC or USGBC approved equivalent.
d. Materials Reuse
e. Recycled Content
f. USGBC approved program meeting leadership extraction criteria.

3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Product Handling: Protect carpet before, during and after installation. Immediately repair or replace all damaged materials as directed at no additional cost to Owner.

1.5 EXTRA STOCK

A. Extra Materials: Furnish extra stock in the amount of 2% of the actual carpet area installed. The extra stock shall be from the same run and dye lot as the installed carpet.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Carpet (Type 1): Vertical Layers by Shaw Contract Group or accepted equal, using styles Relief (Type 1A), Expose (Type 1B), and Uncover (Type 1C).
1. Construction: Multi-level pattern loop.
2. Gauge: 1/12".
3. Fiber Product: EcoSolution Q nylon.
4. Tufted Weight: 20 oz. per square yard.
5. Backing Construction: EcoWorx Tile.
6. Size: 9 x 36".
7. Install Pattern: Ashlar.
8. LEED Requirement: Carpets installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institutes Green Label Plus Program.

B. Carpet (Type 2): Vertical Layers by Shaw Contract Group or accepted equal, using styles Undertone (Type 2A) and Tinge (Type 2B).
1. Construction: Multi-level pattern loop.
2. Gauge: 1/10 inch.
3. Fiber Product: Eco Solution Q® Nylon.
4. Tufted Weight: 17.0 oz/yd2
5. Backing Construction: Ecoworx® Tile.
6. Size: 9.0 x 36.0 inches.
7. Install Pattern: Ashlar.

8. LEED Requirement: Carpets installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institutes Green Label Plus Program.

C. Carpet Edge Guard: Extruded or molded heavy-duty vinyl or rubber carpet edge guard of size and profile required and with minimum 2" wide anchorage flange. Color selected by Architect from manufacturer's standard colors.

D. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
   1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

E. Leveling Compound: Portland Cement based latex type as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

A. Examine substrates and other conditions under which carpeting is to be installed. Do not proceed until unsatisfactory conditions have been corrected.

B. Repair minor holes, cracks, depressions to assure one constant floor height after carpet is installed using leveling compound in accordance with manufacturer's recommendations.

C. Clear away debris and scrape up protruding deposits from surfaces to receive carpeting; vacuum clean immediately before installation.

3.2 INSTALLATION

A. General
   1. Comply with manufacturer's instructions and recommendations.
   2. In rooms terminate carpet beneath doors at face of door farthest from hallway or open office area.
   3. Extend carpet under open-bottomed obstructions and under removable flanges and furnishings and into alcoves and closets of each space.
   4. Provide cutouts where required and bind cut edges properly where not concealed by protective edge guards or overlapping flanges.
   5. Install carpet edge guard where edge of carpet is exposed; anchor edge guards to substrate.
   6. Install carpet in the direction of traffic flow and to minimize seaming.

B. Glue-Down Installation
   1. Fit sections of carpet into each space prior to application of adhesive.
   2. Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt carpet edges tightly together to form seams without gaps. Roll entire carpet area lightly to eliminate air pockets and ensure uniform bond. Remove adhesive promptly from face of carpet.

3. Comply with carpet manufacturer's recommendations for seaming. Trim edges and apply adhesive to provide seam strength to resist stresses during life of the carpet.

3.3 CLEANING AND PROTECTION

A. Remove and dispose of debris and unusable scraps.

B. Vacuum carpet. Remove spots and replace carpet where spots cannot be removed. Remove any protruding face yarn using sharp scissors.

C. Protect carpet to ensure that carpeting will be without deterioration or damage at time of substantial completion.

D. Maintenance Materials: Deliver usable scraps of carpet to Owner's designated storage space, packaged and identified.

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SECTION 098413
FIXED SOUND-ABSORPTIVE PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
   1. Acoustic Wall Panel System.

1.2 REFERENCES

A. ASTM E84 – Surface Burning Characteristics of Building Materials.

B. ASTM C208 – Cellulosic Fiber Insulating Board.

C. ASTM C423 – Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

D. ASTM C612 – Mineral Fiber Block and Board Thermal Insulation.

E. NFPA 255 – Surface Burning Characteristics of Building Materials.

F. NFPA 701 – Fire Tests for Flame Propagation of Textiles and Films.

1.3 SUBMITTALS

A. Product Data:
   1. Manufacturer's Technical Data: Submit for track, backing material, and fabric showing compliance with Specifications.
   2. Installation Instructions: Submit track manufacturer's installation instructions.
   3. Cleaning Instructions: Submit fabric manufacturer's cleaning and instructions for fabric.

B. Shop Drawings:
   1. Show types and locations of panels and fabric direction [pattern matching or repeats].

C. Samples:
   1. Panel: Submit two 1' x 2' panels.
   2. Samples for Initial Color Selection: Submit manufacturer's standard tip cards showing full range of colors and textures available.
   3. Samples for Final Selection: Submit swatches in manufacturer's standard size showing color and texture.

D. Mock-Up: Install panel on wall selected by Architect. Notify Architect and allow Architect to review mock-up. Make modifications to mock-up as required by Architect. Accepted mock-up establishes quality for remaining work and may remain as part of Project.

E. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 DELIVERIES, STORAGE, AND HANDLING

A. Comply with instructions of manufacturer. Protect from moisture in shipment, storage, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation.

1.5 PROJECT CONDITIONS

A. Do not install panels until building is enclosed and temperature and humidity are maintained at approximate conditions planned for occupancy and in accordance with instructions of manufacturer.

1.6 WARRANTY

A. Provide panel manufacturer's five-year limited warranty against defects and workmanship.

1.7 EXTRA MATERIALS

A. Fabric: Furnish two percent (2%) of gross wall system area for each color, pattern, and type of fabric used. Pack for storage with protective covering and label.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Acoustic Wall Panel System: Ezo-on-Ezo by Ezobord or accepted equal.

1. Panels
    a. Composition: 100% polyester (min, 50% +/- recycled PET Fiber)
    b. Weight: 8.5 lbs per 3/8" sheet.
    c. Stiffness: 70 (Shore Durometer).
    d. Thickness: ¾", consisting of (2) layers of 3/8" material.
    e. NRC: 0.75.
    f. Edge: Straight Edge.
    g. Corners: Square.
    h. Surface: Plain.
    i. Pattern: Slotted.
    j. Colors: As selected by Architect from manufacturer's full range of options.
2. Fasteners: Provide types suitable for conditions of use as recommended by manufacturer. Provide matching plugs by manufacturer to conceal fastening.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which the wall system is to be applied and notify Architect in writing of conditions detrimental to proper and timely completion. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install acoustic wall panels in accordance with the manufacturer's instructions in conformance with approved shop drawings.

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces and repair minor damage in accordance with the panel manufacturer's instructions.

B. Protect finished installation against damage by other work.

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SECTION 099100
PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.

B. Work Not Included
   1. Concealed Surfaces: Unless otherwise indicated, do not paint within the following, generally inaccessible areas: Foundation spaces, furred areas, utility tunnels, duct or pipe shafts and chases, elevator shafts.
   2. Prefinished Items: Unless otherwise indicated, do not include painting when factory finished or installer finishing is specified for such items as (but not limited to) acoustic materials and finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets.
   3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized or mill finished aluminum stainless steel, chrome plate, copper, bronze and similar finished materials will not require finish painting.
   4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.
   5. Labels: Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual or any equipment identification, performance rating, name or nomenclature plates.
   6. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.

1.2 QUALITY ASSURANCE

A. Single Source Responsibility
   1. Provide primers and other undercoat paint produced by same manufacturer as finish coats.
   2. Use only thinners approved by paint manufacturer and use only within recommended limits.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Color Selection Charts: Submit manufacturer's full color selection guides for each item specified.

C. Samples; Stained or Natural Wood: Two 4" x 8" samples on actual species of wood. Include all finish coats.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Delivery and Storage
   1. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label.
   2. Store materials not in use in tightly covered containers in a well ventilated area at a minimum ambient temperature of 45^{O}F.
   3. Protect from freezing. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
   4. Keep storage area neat and orderly. Remove oily rags and waste daily.
   5. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing and application.

B. Application
   1. Apply water-base paints only when temperatures of surfaces to be painted and surrounding air temperatures are between 50^{O}F (10^{O}C) and 90^{O}F (32^{O}C) unless otherwise permitted by paint manufacturer's paint instructions.
   2. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45^{O}F (7^{O}C) and 95^{O}F (35^{O}C), unless otherwise permitted by paint manufacturer's printed instructions.
   3. Do not apply paint in snow, rain, fog or mist or when relative humidity exceeds 85% or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
   4. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Paint and coating systems for each substrate are indicated in paint schedules below. Unless otherwise noted, paint and coating system designations are for Benjamin Moore and Company.

B. Interior Paintable Caulking: Siliconized acrylic latex caulk conforming to ASTM C834.

C. Spackling: Shrink free spackling paste.

2.2 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal (Gloss Finish/Polyurethane) – Shop applied, with field touchup only.
1. Primer and Touch up: Series 90-97 Tnemec-Zinc by Tnemec or accepted equal.
2. First Coat: FC27 Typoxy by Tnemec or accepted equal.
3. Second Coat: 1078 Fluoronar Metallic by Tnemec or accepted equal.
4. Third Coat: 1079 Fluoronar Clearcoat by Tnemec or accepted equal.

B. Galvanized Metal (Gloss Finish/Polyurethane) – Shop Applied with field touchup only.
1. Special Preparation: Clean using Armex media to provide a suitable surface profile for adhesion.
2. First Coat: FC27 Typoxy by Tnemec or accepted equal.
3. Second Coat: 1078 Fluoronar Metallic by Tnemec or accepted equal.
4. Third Coat: 1079 Fluoronar Clearcoat.

2.3 INTERIOR PAINT SCHEDULE

A. Gypsum Drywall (Typical Walls; Eggshell Finish, Latex.)
1. Primer: 1 coat Interior Super Spec Latex Undercoater and Primer Sealer (253).
2. Finish: 2 coats Super Spec Interior Latex Enamel - Eggshell (274).

B. Gypsum Drywall (Bathrooms, Shower Rooms, Mechanical Rooms, and Storage Rooms; Semi-Gloss Finish/Latex)
1. Primer: 1 coat Interior Super Spec Latex Undercoater and Primer Sealer (253).
2. Finish: 2 coats Super Spec Interior Latex Enamel – Semi-Gloss (276).

C. Ferrous Metal (Hollow Metal Doors and Frames; Semi-Gloss Finish/Latex)
1. Spot Prime: Ironclad Retardo Rust Inhibitive Primer 493.
2. First and Second Finish Coats: Regal Aquaglo 333.

D. Ferrous Metal (Except Doors and Frames; Gloss Finish/Alkyd) – Shop Applied with field touchup only.
1. Spot Prime: Ironclad Retardo Rust Inhibitive Primer 493.
2. First and Second Finish Coats: Impervo High Gloss Enamel 133.

E. Masonry Walls Type 1 (Zero Waste Walls, Semi-Gloss Finish/Epoxy)
1. Primer: 1 coat Moorcraft Latex Block Filler (285).
2. Finish: 2 coats Super Spec HP Acrylic Epoxy Semi-Gloss (P43-86).

F. Masonry Walls Type 2 (Semi-Gloss Finish/Latex)
1. Primer: 1 coat Moorcraft Super Craft Latex Block Filler (285).

2. Finish: 2 coats Super Spec Interior Latex Enamel Semi-Gloss (276).

G. Masonry Walls Type 3 (Existing Concrete Columns,)
1. Primer: 1 coat Moorcraft Latex Block Filler (285).
2. Finish: 2 coats Super Spec Interior Latex Enamel - Eggshell (274).

H. Cementitious Flooring
1. Underlayment: Texture Resin & Bond Coat by H&C.
2. Primer: Dual Component Texture by H&C.
3. Top Coat (2 Coats): Armorseal 8100 Water Based Epoxy Finish by Sherwin Williams.

PART 3 - EXECUTION

3.1 INSPECTION

A. Applicator shall examine areas and conditions under which painting work is to be applied and notify Contractor, in writing, of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

B. Starting paint will be construed as Applicator's acceptance of surfaces or conditions within a particular area.

3.2 GENERAL

A. Painting, including surface preparation, and finishing, as noted on the Finish Schedule for walls, floors and ceilings, is to include all components of the surface including but not limited to the field material, trim, doors, windows and other miscellaneous items unless specifically excluded.

3.3 SURFACE PREPARATION

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as specified for each particular substrate condition.
1. Provide barrier coats over incompatible primers or remove and reprime as required.
2. Provide barrier coats to conceal stains. Notify Architect, in writing, of any anticipated problems in using the specified coating system with substrates primed by others.
3. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in place and not to be finish-painted or provide surface-applied protection prior to surface preparation and painting operations. Remove these items, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

B. New Wood
1. Sandpaper smooth all finished surfaces exposed to view.
2. All cracks, crevices, holes shall be filled with wood filler. Apply as many coats as required to fill surface flush with original wood surface and sand smooth.
3. Remove dust and loose material by brushing, sweeping, vacuuming or blowing with high pressure air.

4. For surfaces to be painted, scrape and clean small, dry seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of priming coat.
5. After priming, fill all locations between separate pieces of wood requiring caulking.
6. Prime, stain or seal wood required to be job-painted immediately upon delivery. Prime or seal edges, ends, faces, undersides and backsides of wood, including cabinets, counters, cases and paneling.

C. Ferrous Metal
1. Remove all loose paint, dirt, chalking, rust and other foreign substances with wire brush and sandpaper down to sound substrate.
2. Sandpaper smooth all finished surfaces exposed to view. Where patches of existing paint are securely adhered, uniformly feather all edges of adhered paint to substrate by sanding.
3. Remove dust and loose material by brushing, sweeping, vacuuming or blowing with high pressure air.
4. Finish cleaning all soiled surfaces before applying paint by scrubbing with biodegradable detergent followed by a water rinse.
5. Clean surfaces of new metal with mineral spirits prior to painting.
6. Touch up shop-applied prime coats wherever damaged or bare with paint compatible with shop coat.

D. New Gypsum Board
1. All surfaces must be free of sanding dust and joint treatment should be thoroughly dry.
2. Damaged or defective surfaces are to be repaired by spackling or by other appropriate measures.
3. Steel corner beading is to be coated with stain covering primer/sealer before applying water-thinned coatings.

E. Cementitious Materials
1. Remove asphalt flood coat, efflorescence, chalk, dust, dirt, grease, oils and release agents.
2. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
3. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
4. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application.
5. Clean concrete floors to be painted with a 5% solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia and rinse; allow to dry. Vacuum before painting.

3.4 APPLICATION

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors will be selected by the Architect. Surface treatments and finishes are indicated in "schedules" of the Contract Documents.
2. Provide finish coats which are compatible with prime paints used.

3. Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by manufacturer. The number of coats and film thickness required is the same regardless of the application method.
4. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including, edges, corners, crevices, welds and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
5. Paint surface behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
6. Finish doors on tops, bottoms and side edges the same as faces, unless otherwise indicated. Paint frame kits for glazing in wood and metal doors.
7. Sand lightly between each succeeding enamel or polyurethane coat.

B. Scheduling Painting
1. Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Prime Coats
1. Apply prime coat to substrate which is required to be painted or finished and which has not been prime coated by others.
2. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Opaque Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Use of tinted primer does not relieve requirement for the number of finish coats noted in 2.3. Cloudiness, spotting, holidays, laps, brush marks, run, sags, ropiness or other surface imperfections will not be acceptable.

E. Complete Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specific requirements.

3.5 CLEAN UP AND PROTECTION

A. Clean Up: At the end of each work day, remove empty cans, rags, rubbish and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

C. Protect work of other trades, whether it be painted or not, against damage by painting and finishing work. Correct any damage as directed by Architect.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

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SECTION 101100
VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Tackboards.
   2. Glass enclosed tackboards.

1.2 QUALITY ASSURANCE

A. Manufacturer: Furnish all chalkboards and tackboards by a single manufacturer for the entire project.

B. Performance Characteristics: Provide fabric-faced tackboards with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E84.
   1. Flame Spread: 25 or less.
   2. Smoke Developed: 10 or less.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product information and installation instructions for each item, including test reports which show that materials comply with flame spread requirements.

B. Shop Drawings: Submit shop drawings for each type of chalkboard and tackboard. Include sections of typical trim members and dimensioned elevations. Show anchors, reinforcement, accessories, layout and installation details.

C. Samples: Submit samples of each board's type, trim and manufacturer's standard samples of fabric.

D. LEED Submittals
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path

as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tackboards: Connect X2 Series by Claridge or accepted equal. Provide clear anodized aluminum frame and 1550 Series Fabricork over 7/32" cork over ¼" hardboard. Sizes as noted on drawings. Color to be selected by Architect.

B. Glass Enclosed Tackboards:
   1. Glass enclosed tackboard (72" wide x 48" high): Frameless sliding door style by Aarco or accepted equal. Tackable surface to be ¼" VIC cork laminated to ¼" hardboard. Aluminum frame to be powder coated, color as selected by Architect from manufacturer's full range of options.
   2. Glass enclosed tackboard (36" wide x 48" high): Hinged single door style by Aarco or accepted equal. Tackable surface to be ¼" VIC cork laminated to ¼" hardboard. Aluminum frame to be powder coated, color as selected by Architect from manufacturer's full range of options.

C. Tackable Wall Surface: Surface Systems' System Four by Forbo or accepted equal.
   1. Provide panels with square cut of chamfered edges, installed utilizing an exposed horizontal narrow mainrunner and exposed vertical narrow crossrunner, for proper panel alignment.
   2. All exposed application hardware shall be provided in clean satin anodized aluminum.
   3. All decorative interior wall surfaces shall be Surface Systems with panel construction and finish as follows:
      a. Tackable panels are a non-directional, 'self-healing' linoleum product with a linseed oil base. Panels are ¼" thick, edges are square cut and unfinished, to match the face. Color: To be selected by architect.
   4. All panel sizes shall be nominal 24" wide x 24" high (actual panel size varies dependent upon system).
   5. Accessories: All trim specified shall be heavy weight extruded aluminum 6063-T5 alloy with clear satin anodized aluminum finish.
      a. Shadowline Inside Corner trim shall be Marlite's part #S-450 Shadowline Inside Corner, provided in 10' lengths.
      b. Shadowline Outside Corner trim shall be Marlite's part #S-460 Shadowline Outside Corner, provided in 10' lengths.
      c. Shadowline Batten trim shall be Marlite's part #S-465 Shadowline Batten, provided in lengths as required.
      d. Shadowline Perimeter (edge) trim shall be Marlite's part #S-470 Flat Edge, provided in 10' lengths.
   6. Adhesive: #C375/#C376 Adhesive as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb and level. Provide all adhesives, anchors, trim and accessories necessary for a complete installation.

B. Join all parts with a neat, precision fit.

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SECTION 101139
VISUAL DISPLAY RAILS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
   1. Tack Rail.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions.

B. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

C. Warranty: Ten years on tack surface.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tack Rail: 3" aluminum map rail with 44 Gray insert by Best-Rite or accepted equal.
   1. Length varies as indicated on drawings.
   2. Provide end caps, mechanically fastened.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which work is to be installed. Do not proceed with installation until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Securely install plumb and level in conformance with approved submittals and manufacturer's recommendations.

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SECTION 101400
SIGNAGE AND DIRECTORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Interior panel signs.
   2. Exterior building sign.

1.2 QUALITY ASSURANCE

A. Uniformity: For each sign form and graphic image process indicated, furnish products of a single manufacturer.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.

B. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacturer and design of each sign component including graphics.

C. Shop Drawings: Provide drawings indicating layout and construction with full size selections of typical members.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

E. Submit manufacturer's printed installation instructions.

F. Closeout Submittals:
   1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
   2. Submit warranty documents specified herein.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 1.
   1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
   2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
   4. Handle products in accordance with manufacturer's instructions.

1.5 WARRANTY

A. Project Warranty: Comply with requirements of Division 1.

B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
   1. Warranty Period: One (1) year from Substantial Completion.

PART 2 - PRODUCTS

2.1 SIGNAGE SYSTEMS

A. Provide all signage indicated on the drawings.

B. Acceptable Manufacturers:
   1. Basis of Design, Interior Signage: Mohawk Signs Systems, PO Box 966, Schenectady NY 12301 (518) 842-5303,
   2. Substitutions: Submit in accordance with Division 01.

2.2 SIGN MATERIALS

A. Interior and Exterior Sign System shall consist of 1/4" acrylic backer plate with beveled edge (Color 1), 1/8" MP Plastic face panel (Color 2), with raised symbol, copy and braile (Color 3), graphic process Series 200A – Sand Carved. Plate to have permanently adhered raised Color 3 tactile lettering and/or graphics. Lettering to be provided with ADA compliant raised braille for each character:
   1. *Backer plate color: As selected by Architect, with 45 degree bevel on frame face.*
   2. *Frame Size: As noted on drawings and molded ready to receive insert plate.*
   3. *Face Panel Color: Low glare as selected by Architect with 45 degree bevel on insert face.*
   4. *Backer Thickness: 1/4"*
   5. *Face Panel thickness: 1/8".*
   6. *Character Color: Brilliant White at all rooms unless noted otherwise, reflective lettering at all mechanical and electrical rooms.*

7. *Character Total Thickness: 1/32" minimum or as appropriate to height and installation.*
8. *Character Edges: Bold Bevel.*
9. *Character Font: Optima Bold Font.*
10. *Character Case: All Upper Case, unless indicated otherwise.*
11. *Braille Color: Brilliant White.*
12. *Sign Mounting at Interior Walls:* pin reject hexalobular fasteners, color matched to panel, attached to solid backing within wall.
13. *Sign Mounting at Glass:* Double-sided tape, 4 sides, with Color 2 backing panel adhered to opposite side of glass. Backing panel to be the same size as sign panel.
14. *Sign Mounting at Exterior:* pin reject hexalobular fasteners, color matched to panel.
15. Accessories: Double-sided tape, high tack, permanent adhesive type (interior signs, only at glass).
16. Quantity: Provide (1) sign for each door including elevators.

B. Interior Vinyl Decal Letter Signs: Vinyl decal letters.
1. Provide 2" high vinyl decal letter signs on the door frame of each bedroom and suite bathroom to identify the room. Copy shall be 4 characters typical.
2. Provide 2" high vinyl decal letter signs up to 100 characters in arrangements to be determined during construction by the architect.

C. Exterior Building Sign: Blade style, double-sided sign.
1. Frame: 2" square tube wall brackets, painted black with guidewire for mounting.
2. Banner: 18"W x 56"H rigid aluminum face mounted to wall brackets with aluminum angle. Color: Custom Color.
3. Lettering: See Drawing A900. Color: (2) custom colors. Non-reflective vinyl on banner.

2.3 FABRICATION - GENERAL

A. Refer to drawings for details.

B. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

C. Conceal fasteners if possible; otherwise, locate fasteners to appear inconspicuous.

D. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

E. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.

B. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions

3.2 INSTALLATION

A. Securely install product plumb and level in accordance with approved submittals and supplier's instructions.

B. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.

C. Install product level, plumb, and at heights indicated.

D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.

E. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
   1. Interior Signs: Within 1/4 inch vertically and horizontally of intended location.

F. Interior Panel Signs: Wall mount adjacent to latch side of door at with Braille at 54" above finished floor unless noted otherwise on the drawings. Coordinate location of sign with proximity reader and electrical devices on opposite side of wall.

G. Low-Emitting Adhesives, Sealants, Paints and Caulking: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with VOC limits regulated by New York State.

H. For all wall plaques on gypsum board walls: Fasten with pin reject hexalobular mechanical fasteners thru solid blocking in wall.

3.3 CLEANING, PROTECTION, AND REPAIR

A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet.

B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with the manufacturer's instructions, prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1. Protect from damage until acceptance.

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SECTION 102113
TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Toilet partition.

1.2 QUALITY ASSURANCE

A. Field Measurements: Take field measurements before preparation of Shop Drawings and fabrications to ensure proper fitting of the work.

B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication and installation, including catalog cuts of anchors, hardware, fastenings and accessories.

B. Shop Drawings: Submit shop drawings for the fabrication and erection of toilet partitions.

C. Samples: Submit samples of manufacturer's standard colors for each type of partition and screen.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 4.1: For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Toilet Partition: Floor-to-ceiling braced solid high density polyethylene by Scranton Products or accepted equal. Color to be selected by Architect.
   1. Panels, Doors and Pilasters: 1" thick HDPE with edges uniformly machined to a 1/4" radius. Side panels and door shall be 60" high. Pilasters shall be full height floor to ceiling. Provide a minimum of one level adjusting bolt at the floor for each pilaster.
   2. Hardware
      a. Hinges: 8" heavy duty extruded aluminum with bright dip anodized finish with wrap around flanges, surface mounted and through bolted to doors and pilasters with stainless steel one-way bolts. Provide field-adjustable nylon cams set in 30º intervals.
      b. Wall Brackets: 54" long heavy-duty extruded aluminum single-ear continuous wall bracket. Thickness to be .125". Provide stainless steel tamper-resistant torx screws for bracket to pilaster fastening. Panels to be through bolted into brackets with stainless steel tamper resistant sex bolts. Attach brackets to wall construction with stainless steel phillips head screws.
      c. Pilaster Shoes (Floor and Ceiling): 3" high 20-guage stainless steel. Pilaster shoes shall be anchored to the finished floor and ceiling with stainless steel phillips head screws and plastic anchors. Pilaster shoes shall be through bolted onto pilaster with stainless steel, tamper resistant sex bolts.
      d. Latches: Heavy duty extruded aluminum alloy with bright dip anodized finish. Slide and button shall have a black anodized finish. Latch shall be mounted to the door with stainless steel, tamper resistant sex bolts.
      e. Strike and Keeper: 6" long heavy duty extruded aluminum alloy with bright dip anodized finish and wrap around flanges. Strike and keeper is mounted to the pilaster with stainless steel, tamper resistant sex bolts. The bumper shall be made of flexible vinyl.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which work is to be installed. Proceed with work only after satisfactory and acceptable conditions exist.

3.2 INSTALLATION

A. Install partitions and screens in rigid, straight, plumb and level manner with panels laid out as shown on the Drawings. Secure panels to supporting walls with manufacturer's recommended anchoring devices. Secure pilasters to supporting floor and tighten with leveling device. Set in closed position.

3.3 CLEANING AND PROTECTION

A. Perform final adjustments to plaster leveling devices and other operating parts just before final review. Adjust and lubricate hardware for proper operation after installation. Set hinges on in-swing doors to hold door approximately 30 degrees from the closed position when unlatched.

B. Clean exposed surfaces and touch-up minor scratches and other finish imperfections using materials and methods recommended by partitions manufacturer.

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SECTION 102213
WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Wire mesh partition.

1.2 QUALITY ASSURANCE

A. Provide wire mesh partitions as complete units with panels, doors, corners, posts and mounting hardware by single manufacturer.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions.

B. Samples: Submit manufacturer's standard color chart.

C. Shop Drawings: Submit Shop Drawings showing fabrication and installation of wire mesh partitions. Include plans, elevations and large scale details showing anchorage and accessory items. Provide location template drawings for items supported or anchored to permanent construction.

1.4 JOB CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of work. However, allow for adjustments and fitting wherever taking of field measurements before fabrication might delay work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wire Mesh Partition: Model 130A as manufactured by Acorn Wire and Iron Works, Inc. or accepted equal.
   1. Provide full height floor to underside of slab above panels of standard construction as noted.
   2. Provide 3'-6" x 7' swing door with mortise type cylinder locks operated by key outside and recessed knob inside. Key shall match campus standard.
   3. Provide bolts, hardware, filler panels, corners and accessories for complete installation.
   4. Provide manufacturer's standard electrostatic enamel paint finish. Color as selected by Architect to match Air Force Blue of King Signage.

PART 3 - EXECUTION

3.1 INSPECTION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Inspect substrate and conditions under which work is to be installed. Do not proceed until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install wire mesh partitions at locations shown in accordance with manufacturer's instructions for plumb, level, rigid and flush installation.

B. Provide additional field bracing as necessary for rigid, secure installation. Erector to provide additional clips and bracing as required.

3.3 CLEANING AND PROTECTION

A. Adjust doors and hardware to operate easily without binding. Verify that locking devices are operating properly.

B. Touch-up marred finishes, but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

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SECTION 102610
CORNER GUARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Stainless steel corner guards.

1.2 QUALITY ASSURANCE

A. Coordinate carpentry work to assure proper installation of solid fire retardant wood blocking for all accessories. Use of toggle or expansion type anchors in gypsum board shall not be permitted.

B. Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

D. Materials shall be UL classified; identified upon shipment with appropriate marking and shall be supported by Underwriter's Laboratories, Inc. follow up procedures.

1.3 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, specifications and installation instructions for each accessory.

B. Shop Drawings: Show fabrication details and connections to adjacent work.

C. Samples
   1. Corner Guards: One foot long section, include end cap.
   1. Tamper Resistant Fasteners: 6 each type.

D. LEED Submittal
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification

section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel Corner Guard: Model CO-8 by Construction Specialties or accepted equal.
   1. Corner Guard: Surface mounted guards to be 16 gauge stainless steel.
      a. Fire Hazard Classification: Class I when tested in accordance with ASTM E4.
      b. Finish: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applications and designations of finishes.
      c. Height: 48” above finish floor with 4” high aluminum snap in base.
   2. Fasteners: Manufacturer's standard stainless steel tamper resistant fasteners for substrate involved.
   3. Fire Resistance: Manufacturer's standard fire barrier for one hour rating.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

A. Examine the conditions under which the work is to be installed. Do not proceed with installation until all unsatisfactory conditions are corrected.

B. Provide solid wood blocking at all mounting locations.

C. Provide metal corner reinforcing with durabond grout fill full height of existing chamfered corners of all concrete piers exposed to view.

3.2 CORNER GUARD INSTALLATION

A. Install corner guard in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated. Secure corner guards to substrate with fasteners spaced 18 inches on center maximum.

B. Corner guard retainer assemblies shall be delivered to the job before installation of the wall begins. Where vinyl cove base is to be used, a structural aluminum support base installed at bottom of retainer shall be supplied to provide rigid backup to cove base. Retainer assemblies shall be installed prior to application of drywall, according to the manufacturer's recommendations. Corner guards shall be installed after painting or wall covering has been completed. Installation to conform to manufacturer's approved details.

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SECTION 102623
FIBER REINFORCED PLASTIC PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Fiber reinforced plastic panels.

1.2 SUBMITTALS

A. Product Data: Catalog sheets, specifications, and installation instructions.

B. Samples
   1. Panels: 12 inches square.
   2. Molding and Trim Pieces: 12 inches long, full section, each type.
   3. Color Samples: Manufacturer's standard colors and textures.

C. Shop Drawings: Submit small scale layouts of panels on walls and large scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures and special details. Field measurements shall be taken prior to completion of shop drawings and shop fabrication.

D. LEED Submittals
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives and sealants, including printed statement of VOC content and chemical components.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

B. Installer qualifications: Engage an installer who has no less than 3 years' experience in installation of wall panels similar in complexity to those required for this project.

C. Surface-Burning Characteristics: Provide Class B finish as determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 75 or less.
   2. Smoke-Developed Index: 350 or less.

D. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476

1.4 PROJECT CONDITIONS

A. Environmental Requirements: Comply with manufacturer's written recommendations regarding environmental conditions under which panels can be installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rigid Wall Panel with Adhesive Wrapped Square Edge: Acrovyn by CS Group or equal. Wallcovering to be permanent adhesive wrapped on 3/8" particle board panels.
   1. Approximate Thickness: 0.040"
   2. Fire Rating: Class B/2.
   3. Texture: Suede.
   4. Pattern/Color: Chameleon Collection, #1349 Indian Elm
   5. Sizes: Panel sizes as noted on drawings.
   6. Construction: Engineered PETG free of PVC & PBTs
   7. Installation Method: Adhesive mount with factory finished thermoformed outside corners.

B. Trim Pieces and Moldings: Manufacturer's standard or recommended one piece vinyl for edge conditions.

C. Adhesive: Manufacturer's standard or recommended high strength waterproof adhesive for substrate involved.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the Work of this Section in accordance with the manufacturer's printed instructions, using approved adhesive.

B. Temperature at the time of installation must be between 65-75 degrees Fahrenheit and must be maintained for at least 48 hours after the installation to allow for proper adhesive set-up.

C. Relative humidity shall not exceed 80%.

D. Do not expose wall covering to direct sunlight during or after installation. This will cause the surface temperature to rise, which will cause bubbles and delamination.

3.2 CLEANING

A. Remove dirt and other foreign substances from exposed surfaces in accordance with manufacturer's printed cleaning instructions.

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SECTION 102813
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Toilet accessories.

1.2 SUBMITTALS

A. Product Data: Manufacturer's catalog and data sheets, parts lists and installation requirements for each accessory item specified.

B. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.3 JOB CONDITIONS

A. Deliver items in manufacturer's original unopened protective packaging.

B. Coordination: Coordinate accessory locations, installation and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Surface Mounted Mirror: Bobrick B-2908 (custom size as noted on Drawings) with tempered glass mirror. Provide set screw fastening of mirror to mounting bracket.

B. Surface Mounted Toilet Tissue Dispenser: Bobrick B-2890.

C. Surface Mounted Soap Dispenser: 2000 Series by Hillyard or accepted equal.

D. Grab Bar: Bobrick B-6806 with cover escutcheon to conceal fasteners (all horizontal and vertical configurations shown on drawings) or accepted equal.

E. Shower Curtain Rod: Bobrick 207 or accepted equal.

F. Shower Seat: Bobrick B-5181 or 5171 as shown on drawings, provided and installed by Owner.

G. Shower Curtains and Hooks: Medium weight vinyl by Express Supply Worldwide or accepted equal. Provide flame retardant anti-microbial. Color: White. Shower curtain width to have 1 foot extra fullness. Shower curtain length to be 1/2" above shower floor. Dressing room curtain length to be 6" above floor. Provide manufacturer's standard rustproof grommets and hooks on 6" centers along top hem.
   1. Attic Stock: Furnish (10) ten extra shower curtains to the Owner in original packaging.

H. Towel Hook: Bobrick B-7672 surface mounted double hook, stainless steel with bright polished finish or accepted equal.

I. Mop and Broom Holders: Bobrick B-239 x 34" or accepted equal.

J. Surface Mounted Electric Hand Dryer: TA-ABS ThinAir by Excel Dryer Inc. or accepted equal by Dyson or World Dryer. Provide white polymer cover and 89W White Antimicrobial Wall Guards (one per dryer). Trim wall guards to fit below dryers where mounted over counters. 120V electrical voltage with wattage to be selected by Architect during submittal process.

K. Towel Bar: Bobrick B-674 x 24" or accepted equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which the work is to be installed. Do not proceed until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install accessories at location and heights indicated, level and plumb. Installation methods shall be in accordance with manufacturer's recommendations. All exposed fasteners to be tamperproof. Finish of exposed fasteners to match items secured.

B. Install manufacturer's recommended anchors for all accessories.

C. Fit flanges of accessories snug to wall surfaces. Provide for caulking in gaps between return flanges and finish wall surface after accessories are installed.

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SECTION 104400
FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Fire extinguisher cabinet.
   2. Fire extinguisher.

1.2 QUALITY ASSURANCE

A. Coordination: Verify that fire extinguisher cabinets are sized to accommodate fire extinguishers.

B. UL-Listed Products: Fire extinguishers UL-listed and bearing UL "Listing Mark" for type, rating and classification of extinguisher.

1.3 SUBMITTALS

A. Product data for each type of product specified. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style and materials.

B. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fire Extinguisher Cabinet: Cosmopolitan 1037 W 17FX by J.L. Industries or accepted equal.
   1. One hour fire rated semi-recessed cabinet construction with 10-1/2"W x 24"H x 6"D tub interior dimension.
   2. 3" semi-recessed cabinet frame with 5/8" nominal thickness of frame and door.
   3. Stainless steel cabinet with #4 satin finish.
   4. Contemporary slot view window in door with clear tempered glass.
   5. Saf-t-lok vandal resistant lock consisting of cylinder lock with flexible cam and pull handle.

B. Fire Extinguisher Ansul Sentry AA10S as manufactured by Tyco or accepted equal. Provide multipurpose dry chemical, 10 lbs., fire class A.B.C., UL Rating 4A-60BC.
   1. Locate in Cabinet except in mechanical rooms, electrical rooms, water heater room, control room, Kitchen 020, and Corridor 100B. In these locations, hang fire extinguisher on wall-mounted hook.

C. Fire Extinguisher Class K Wet Chemical Type: Ansul K-GUARD K01-2 by Tyco or accepted equal. To be located in Kitchen 020.
   1. Construction: Stainless steel cylinder with protective nozzle tip orifice seal and nonmetallic nozzle tip finger guard, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin, and upright squeeze grip.
   2. Effectiveness (Rating): Class K fires.
   3. Model Identification and UL Rating: Saturn 25; Class K.
   4. Wall Brackets: Provide manufacturer's steel bracket with powder coat paint finish in manufacturer's standard color, and additional straps designed to secure fire extinguisher to wall or structure and prevent accidental dislodgement, of sizes required for types and capacities of fire extinguishers indicated.
   5. Provide sign as required by NFPA 10 and as indicated on Drawing A900.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which firefighting devices are to be installed. Do not proceed with installation until satisfactory conditions have been corrected.

3.2 INSTALLATION

A. Anchor cabinets securely, plumb and level in conformance with approved shop drawings and manufacturer's recommendations.

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SECTION 105113
METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Metal lockers.

1.2 QUALITY ASSURANCE

A. Provide metal lockers mounting accessories, fittings and fasteners by a single manufacturer.

B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication of special components, when possible, to ensure proper fitting of work. However, allow for adjustment and fitting of trim and filler panels wherever taking of field measurements before fabrication might delay work.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions.

B. Samples: Submit manufacturer's standard color chart.

C. Shop Drawings: Submit shop drawings for metal lockers and benches verifying dimensions affecting locker and bench installations. Show lockers and benches in detail, method of installation, fillers, trim, base, tops and accessories. Include locker numbering sequence information.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.

4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 JOB CONDITIONS

A. Do not deliver metal lockers until building is enclosed and ready for locker installation. Protect from damage during delivery, handling, storage and installation.

PART 3 - PRODUCTS

2.1 MATERIALS

A. Lockers (Single Tier): Heavy Duty Corridor by Republic Storage Systems or accepted equal. Single Tier (12" x 15" x 72") metal lockers with recessed handles and snap-on aluminum number plate. Door and frame to be 16 gauge mild cold rolled sheets steel, body 24 gauge. Recessed louvers in doors. Baked enamel finish on all steel surfaces. Provide sloping top, shelf, coat hooks, fillers and finished ends as required. Numbering sequence and color to be selected by Architect.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

A. Inspect substrate and conditions under which work is to be installed. Do not proceed until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install metal lockers and locker benches at locations shown in accordance with manufacturer's instructions for plumb, level, rigid and flush installation.

B. Space fastenings for lockers about 48" o.c. unless otherwise recommended by manufacturer and apply through backup reinforcing plates where necessary to avoid metal distortion; conceal fasteners insofar as possible.

C. Install locker tops, trim and metal filler panels where indicated using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

D. Adjust locker doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

3.3 CLEANING AND PROTECTION

A. Touch-up marred finishes but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

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SECTION 105500
POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Mailboxes.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions.

B. Compliance: Submit certification of mailbox acceptance by the United States Postal Service (USPS).

C. Shop Drawings: Submit shop drawings for mailboxes verifying dimensions affecting installation. Show mailboxes in detail, including method of installation, fillers, trim, base, tops and accessories. Include mailbox numbering sequence information.

D. LEED Submittal:
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.3 JOB CONDITIONS

A. Do not deliver mailboxes until building is enclosed and ready for mailbox installation. Protect from damage during delivery, handling, storage and installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mailbox: Model #2230 Aluminum Mailbox Standard System by Salisbury Industries or accepted equal. Provide Custom Engraved Placards and combination locks at each mailbox. Provide aluminum trim on outside of mailboxes. Provide adhesive numbers on inside face of mailboxes.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

A. Inspect substrates and conditions under which work is to be installed. Do not proceed until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install mailboxes at location shown in accordance with manufacturer's instructions for plumb, level, rigid and flush installation.

B. Space fastenings for mailboxes as recommended by manufacturer and apply backup reinforcing plates where necessary to avoid metal distortion. Conceal fasteners.

C. Install trim and accessories where indicated using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

D. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

3.3 CLEANING AND PROTECTION

A. Touch-up marred finishes but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by mailbox manufacturer.

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SECTION 113100
RESIDENTIAL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Under Counter Refrigerator.
   2. Refrigerator.
   3. Slide-In Range.
   4. Microwave.
   5. Range hood.

B. Work Specified Elsewhere: Plumbing and Electrical requirements are specified in Divisions 22 and 26.

1.2 QUALITY ASSURANCE

A. Certification Labels: Provide residential equipment which complies with standards and bears certification labels as follows.
   1. Energy Ratings: Provide energy guide labels with energy cost analysis (annual operating costs) and efficiency information as required by Federal Trade Commission.
   2. UL Standards: Provide residential equipment with UL labels.

B. Uniformity: To the greatest extent possible, provide residential equipment by single manufacturer for entire project.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of residential equipment. Submit operating and maintenance instructions for each item of residential equipment.

B. Submit manufacturer's standard written warranty for each item of residential equipment.

C. LEED Submittals: Product Data for appliances indicated showing documentation that products are ENERGY STAR rated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Undercounter Refrigerator (ADA Compliant): Model ALB-651, 32-3/8”(H) x 23-5/8”(W) x 23-1/2”(D) by Summit or accepted equal. Provide aluminum frame to accept custom panel face.

B. Refrigerator (Bottom-Freezer): Model WRB119WFBM by Whirlpool or accepted equal. Energy Star rated, Stainless steel finish.

C. Slide-In Range: Model JS645FLDS Free-Standing Slide-in Electric Range by General Electric or accepted equal. Color: Stainless steel.

D. Microwave (Countertop Installation): Model WMC30516AS, 1.6 Cu ft. by Whirlpool or accepted equal. Stainless Steel finish.

E. Vented Range Hood: Model JVX5305SJSS by General Electric or accepted equal.
   1. Location: RD Apartment, 014.

F. Kitchen Hood: Denlar DS1030-I-DF with fire suppression and 50A-208V electric range shutoff or accepted UL Certified equal. Provide with remote manual pull station.
   1. Location: Kitchen 020.
   2. Operation: The kitchen range will not operate unless this kitchen hood is on. A shunt trip will disconnect power to the range in case the fire suppression system is activated. Coordinate with electrical and mechanical drawings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations.

B. Securely anchor built-in equipment to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper function and rough openings are completely concealed.

C. Place freestanding equipment in final locations after finishes have been completed in each area. Verify that clearances are adequate for proper operation of equipment.

D. Make final connections to rough plumbing and electrical services.

E. Coordinate installation of kitchen hood with mechanical ductwork, and fire alarm system work shown on the mechanical and electrical drawings. Provide all testing in compliance with NFPA 17A (2009), including but not limited to discharge test, shunt trip, etc. Coordinate testing with Fire Alarm Subcontractor, Owner and AHJ. Operate as required.

3.3 CLEANING AND PROTECTION

A. Test each item of residential equipment to verify proper operation. Make necessary adjustments.

B. Verify that accessory items required have been furnished and installed.

C. Remove packing material from residential equipment items and leave units in clean condition, ready for operation.

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SECTION 123530
RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included
   1. Plastic laminate faced cabinets.

1.2 QUALITY ASSURANCE

A. Kitchen Cabinet Standard: ANSI A161.1.

B. Field Measurements: Verify cabinet dimensions to field measurements, finish wall to finish wall.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions indicating materials, hardware and finishes used in fabrication of kitchen cabinets as required to show compliance with specifications.

B. Shop Drawings: Submit shop drawings indicating location and size of each type of cabinet, accessories, materials, finishes, hardware types and locations, fillers, etc. Include fully dimensioned plans and elevations and indicate details of anchorage to countertop and to walls.

C. LEED Submittals
   1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
   2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
      a. Extended Producer Responsibility
      b. Bio-Based Materials
      c. Wood products certified by FSC or USGBC approved equivalent.
      d. Materials Reuse
      e. Recycled Content
      f. USGBC approved program meeting leadership extraction criteria.
   3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
   4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect cabinets during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver cabinets until painting, wet work, grinding and similar operations, which could be performed before installation of cabinets, have been completed in installation areas.

1.5 JOB CONDITIONS

A. Conditioning: Comply with cabinet manufacturer's recommendations for temperature and humidity requirements in cabinet installation areas. Do not install cabinets until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation areas as required to maintain moisture content of installed cabinet work within a tolerance range of the optimum moisture content acceptable to cabinet manufacturer, from date of installation through remainder of construction period.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastic Laminate-Faced Cabinets: Custom by Millbrook Custom Kitchens or accepted equal.
   1. Provide 5/8" industrial grade particle board for all cabinet component parts, with 4 mil white melamine on interior sections and manufacturer's standard colored .030 high pressure laminate on all exposed exterior parts. Construction shall be by steel dowel jointing.
   2. Provide "New Yorker" style plain doors with high pressure laminate on both sides with matching .024 solid PVC edging.
   3. Provide 1/2" industrial grade particle board for all drawer components with 1/2" hardboard bottoms.
   4. See Section 064000 for hinges, pulls, and other cabinet hardware.
   5. Colors to be selected by Architect from manufacturer's standard colors.
   6. Handicapped Adaptable Base Cabinets: All base cabinets to be 32 ½" high x 24" deep with 4" high toe space. Provide sink base cabinet with removable face frame and bottom assembly in compliance with ADA so that, following removal of front and bottom, all remaining exposed surfaces shall be finished laminate with no exposed dadoes of other unfinished joints of fasteners holes.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect substrate and conditions under which cabinets are to be installed. Do not proceed until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install cabinets plumb, level, true and straight with no distortions. Shim as required using concealed shims. Where kitchen cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips and molding as indicated or required and in finish to match cabinet face.

B. Anchor cabinets securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions for support of units.

C. Complete hardware installation and adjust doors and drawers for proper operation.

3.3 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

B. Clean exposed and semi-exposed surfaces, touch-up finish as required. Remove and refinish damaged or soiled areas.

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SECTION 124813
FLOOR MATS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Floor mats.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions, details of construction relative to materials, dimensions of individual components, profiles and finishes.

B. Shop Drawings: Show layout and types of floor mat and frames, full-scale sections of typical installations, details of patterns or designs, anchors and accessories.

C. Samples: Submit manufacturer's color charts consisting of actual sections of floor mat and frame materials, showing full range of colors, textures, finishes and patterns available, for each type of floor mat and frame indicated.

D. Maintenance Data: Submit manufacturer's printed instructions for cleaning and maintaining floor mats.

E. LEED Submittal:
1. Product Data for Credit MR 2: Provide Environmental Product Declaration (EPD) or third party certificates that demonstrate impact reduction below industry average in at least three categories identified in specification section 018113.
2. Product Data for Credit MR 3: Provide third party verified Corporate Sustainability Reports (CSR) or manufactures' self-declared reports that document sourcing of raw materials as required in specification section 018113. Or product data and material cost information for one of the following:
   a. Extended Producer Responsibility
   b. Bio-Based Materials
   c. Wood products certified by FSC or USGBC approved equivalent.
   d. Materials Reuse
   e. Recycled Content
   f. USGBC approved program meeting leadership extraction criteria.
3. Product Data for Credit MR 4: Provide product data documenting that the chemical inventory of the product to at least 0.1% as required in specification section 018113. Or Product data demonstrating an ingredient optimization path as required in specification section 018113 and material cost information. Or Product data demonstrating products are sourced from product manufactures who engage in the validated and robust safety and health hazard and risk programs as required in specification section 018113 and material cost information.
4. Product Data for Credit I EQ 3: For adhesives, including printed statement of VOC content.

1.3 JOB CONDITIONS

A. Field Measurements: Check actual blocked out openings in floors as accurate field measurements before fabrication of frames and mats; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Floor Mat: RG-400 Heavy Duty Recessed Floor Mat by Pawling Corporation or accepted equal.
   1. Provide heavy-duty carpet treads of 100% solution dyed nylon. Color to be selected by Architect from manufacturer's standard colors.
   2. Provide extruded 6105 aluminum tread rails and cross supports with flexible vinyl cushions.
   3. Tube and frame shall be extruded 6063-T6 aluminum complete with perforations for drainage. Frame color shall be clear anodized.

2.2 FABRICATION

A. Shop fabricate units of floor mat work to greatest extent possible in sizes as indicated. Fabricate with rail direction perpendicular to traffic direction. Where not otherwise indicated, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints to provide prefabricated corner units without joints.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the conditions under which the work is to be installed. Do not proceed with installation until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install frames and mats to comply with shop drawings and manufacturer's instructions, at locations indicated and with top of frames and mats in proper relationship to one another and to adjoining finished flooring. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with doors that swing across mats to provide under door clearance.

B. Anchor frame members to floor with devices spaced as recommended by manufacturer.

C. Level area beneath mat with latex modified grout to eliminate rocking of mat.

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SECTION 129300
SITE FURNISHINGS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-In-Place Concrete: Section 033000

1.2 SUBMITTALS

B. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions.
C. Maintenance Data for each product

PART 2 PRODUCTS

2.1 BENCHES

A. Manufacturer: Keystone Ridge Designs www.keystoneridgedesigns.com telephone number 800-284-8208

B. Model: Robinson Bench with Back or approved equal

C. Dimensions:
1. Length: 94" (8' nominal)
2. Width: 24-5/16"
3. Height: 31-7/16"
4. Seat Height: 17-3/4"
5. Weight: 200lbs

D. Materials:
1. Cast Aluminum Frame
2. IPE Hardwood slats

E. Color: Black powder coated frame

2.2 BASKETBALL COURT BENCHES

A. Manufacturer: Bison www.bisoninc.com telephone number 800-247-7668

B. Model: Player Bench without backrest #BNF0701AA (7.5' fixed) or approved equal

C. Dimensions:
1. Length: 7'-5"
2. Width: 10"
3. Height: 18" above grade
4. Weight: 30lbs

D. Materials:
3. Legs: 2" x 2" square aluminum tubing; 12ga. Wall thickness. Polyester powder coated finish

4. Seat: 10" x 1 ¾" thickness, molded end caps. Extruded aluminum with clear anodized finish

2.3 BASKETBALL HOOP ASSEMBLY

A. Manufacturer: Bison www.bisoninc.com telephone number 800-247-7668.

B. Model: Steel Ultimate Playground Basketball System #BA871XL-BK or approved equal

C. Materials:
1. Pole: 6" square tubing, 3/16" thick
   1) Height: Ten (10') feet from grade to rim
   2) Finish: Textured black polyester powder coated finish
2. Backboard: 42" x 72" formed and welded steel
   1) Finish: white polyester powder coated finish
3. Rim: (2) – 5/8" diameter high strength steel rings welded together at a minimum of six places.
   1) Net attachment: continuous type constructed 3/16" x 1" steel with punched net attachment slots
   2) Net: nylon
   3) Finish: Rim to be orange powder coated finish

2.4 BIKE RACK

A. Manufacturer: Keystone Ridge Designs www.keystoneridgedesigns.com telephone number 800-284-8208

B. Model: SN07-9, Sonance seven loop bike rack, capacity 9 or approved equal

C. Materials:
1. Commercial-grade materials, at least 25% recycled raw steel, 100% recyclable steel; completely welded for optimum strength and stability according to Keystone Ridge Designs, Inc. CAD drawing; 2" schedule 40 pipe, ¼" x 2" flat steel embedment plate or .188 flat steel bolt down flanges

D. Color: Black powder coated frame

PART 3 EXECUTION

3.1 INSTALLATION

a. Install the work of this section in accordance with the manufacturer's printed instructions, and as detailed on the drawings.

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SECTION 133300
SEGMENTAL BLOCK RETAINING WALL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

A. Work shall consist of furnishing materials, labor, equipment and supervision to install a segmental block retaining wall (SBRW) system in accordance with plans and specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on plans.

1.2 REFERENCE STANDARDS

A. Segmental Retaining Wall Units
   1. ASTM C 140 - Sampling and Testing Concrete Masonry Units
   2. ASTM C 1372 – Standard Specification for Dry-Cast Segmental Retaining Wall Units

B. Geosynthetic Reinforcement
   1. ASTM D 4595 – Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
   2. ASTM D 5262 – Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics
   3. ASTM D 5321 – Standard Test Method For Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic by Direct Shear Method
   4. ASTM D 5818 - Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics
   5. ASTM D 6706 – Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil

C. Soils
   1. ASTM D 698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
   2. ASTM D 2487 – Standard Practice for Classification of Soils for Engineering Purposes
   3. ASTM D 422 – Standard Test Method for Particle-Size Analysis of Soils
   4. ASTM D 4318 – Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
   5. ASTM G 51 – Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing

D. Drainage Pipe
   1. ASTM F 758– Standard Specification for Smooth-Wall Polyvinyl Chloride (PVC) Plastic Underdrain Systems for Highway, Airport or Similar Drainage
   2. ASTM F 405 – Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings

E. Engineering Design
   1. "NCMA Design Manual for Segmental Retaining Walls," Third Edition

F. Where specifications and reference documents conflict, the Wall Design Engineer shall make the final determination of applicable document.

1.3 SUBMITTALS

A. Material Submittals: The Contractor shall submit manufacturers' certifications two weeks prior to start of work stating that the SBRW units and geosynthetic reinforcement meet the requirements of Section 2 of this specification.

B. Design Submittal: The Contractor shall submit two sets of detailed design calculations and final retaining wall plans for approval at least four weeks prior to the beginning of wall construction. All calculations and drawings shall be prepared and sealed by a professional civil engineer (P.E.) – (wall design engineer) experienced in SBRW design and licensed in New York State.

1.4 DELIVERY, STORAGE AND HANDLING

A. Contractor shall check materials upon delivery to ensure that the specified type and grade of materials have been received and proper color and texture of SBRW units have been received.

B. Contractor shall store and handle materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.

C. Contractor shall prevent excessive mud, wet concrete, epoxies and similar materials that may affix themselves from coming in contact with materials.

D. Contractor shall protect materials from damage; no damaged material shall be incorporated into the segmental wall.

E. Geosynthetic shall be protected from UV exposure and the protective covering on geosynthetic shall remain until immediately before installation and shall be stored at temperatures above -10 degrees F.

PART 2 MATERIALS

2.1 SEGMENTAL BLOCK RETAINING WALL UNITS

A. SBRW units shall be machine formed, Portland cement concrete blocks specifically designed for retaining wall applications. SBRW units basis of design:

VERSA-LOK Mosiac Retaining Wall Units as manufactured by VERSA-LOK Retaining Wall Systems.

B. Color of SBRW units shall be by Owner.

C. Finish of SBRW units shall be Mosaic (weathered) as defined by VERSA-LOK.

D. SBRW unit faces shall be of straight geometry.

E. SBRW units shall provide a minimum weight of 120 psf wall face area.

F. SBRW units shall have a depth (front face to rear) to height ratio of 2:1, minimum.

G. SBRW units shall be capable of being erected with the horizontal gap between adjacent units not exceeding 1/8 inch.

H. SBRW units shall be interlocked with connecting pins that provide ¾-inch setback from unit below (yielding a 7-degree cant from vertical).

I. SBRW units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the structure. Any cracks or chips observed during construction shall fall within the guidelines outlined in ASTM C 1372.

J. Concrete SBRW units shall conform to the requirements of ASTM 1372 and have a minimum net average 28 days compressive strength of 3000 psi. Compressive strength test specimens shall conform to the saw-cut coupon provisions of ASTM C140.

K. SBRW units' molded dimensions shall not differ more than + 1/8 inch from that specified, as measured in accordance with ASTM C 140. This tolerance does not apply to architectural surfaces, such as split faces.

2.2 SEGMENTAL BLOCK RETAINING WALL UNIT CONNECTION PINS

A. SBRW units shall be interlocked with VERSA-Tuff Snap-Off connection pins. The pins shall consist of glass-reinforced nylon made for the expressed use with the SBRW units supplied.

2.3 GEOSYNTHETIC REINFORCEMENT

A. Geosynthetic reinforcement shall consist of high-tenacity PET geogrids, HDPE geogrids, or geotextiles manufactured for soil reinforcement applications. The type, strength and placement of the geosynthetic reinforcement shall be determined by procedures outlined in this specification and the NCMA Design Manual for Segmental Retaining Walls (3rd Edition 2009) and materials shall be specified by Wall Design Engineer in their final wall plans and specifications. The manufacturers/suppliers of the geosynthetic reinforcement shall have demonstrated construction of similar size and types of segmental retaining walls on previous projects.

The geosynthetic type must be approved one week prior to bid opening. Geosynthetic types currently approved for this project are:

B. The type, strength and placement of the reinforcing geosynthetic shall be as determined by the Wall Design Engineer, as shown on the final, P.E.-stamped retaining wall plans.

2.4 LEVELING PAD

A. Material for leveling pad shall consist of compacted sand, gravel, or combination thereof (USCS soil types GP,GW, SP, & SW) and shall be a minimum of 6 inches in depth. Lean concrete with a strength of 200-300 psi and 3 inches thick maximum may also be used as a leveling pad material. The leveling pad should extend laterally at least a distance of 6 inches from the toe and heel of the lowermost SRW unit.

2.5 DRAINAGE AGGREGATE

A. Drainage aggregate shall be angular, clean stone or granular fill meeting the following gradation as determined in accordance with ASTM D422:

Sieve Size	Percent Passing
1 inch	100
3/4 inch	75-100
No. 4	0-60
No. 40	0-50
No. 200	0-5

2.6 DRAINAGE PIPE

A. The drainage collection pipe shall be a perforated or slotted PVC, or corrugated HDPE pipe. The drainage pipe may be wrapped with a geotextile to function as a filter.

B. Drainage pipe shall be manufactured in accordance with ASTM F 405 or ASTM F 758.

2.7 REINFORCED BACKFILL SOIL

A. The reinforced soil material shall be free of debris. Unless otherwise noted on the final, P.E.-sealed, retaining wall plans prepared by the Wall Design Engineer, the reinforced material shall consist of the inorganic USCS soil types GP, GW, SW, SP, SM, meeting the following gradation, as determined in accordance with ASTM D422:

Sieve Size	Percent Passing
1 inch	100
No. 4	20-100
No. 40	0-60
No. 200	0-35

B. The maximum particle size of poorly-graded gravels (GP) (no fines) should not exceed 3/4 inch unless expressly approved by the Wall Design Engineer and the long-term design strength (LTDS) of the geosynthetic is reduced to account for additional installation damage from particles larger than this maximum.

C. The plasticity of the fine fraction shall be less than 20.

D. The pH of the backfill material shall be between 3 and 9 when tested in accordance with ASTM G 51.

2.8 GEOTEXTILE FILTER

A. Drainage geotextile shall consist of geosynthetic specifically manufactured for use as a preamble soil filter that retains soil while still allowing water to pass throughout the life of the structure. The type and placement of the geotextile filter material shall be as required by the Wall Design Engineer in their final wall plans and specifications.

PART 3 DESIGN PARAMETERS

3.1 SOIL

A. The following soil parameters, as determined by the Owner's Geotechnical Engineer shall be used for the preparation of the final design:

	Unit Weight (γ) (pcf)	Internal Friction Angle (φ) (degrees)	Allowable Soil Bearing Pressure (psf)	Coefficient of Sliding
Reinforced Fill	120	30		
Retained Soil	120	30		
Foundation Soil	120	30	2,000	0.30

B. Should the actual soil conditions observed during construction differ from those assumed for the design, design shall be reviewed by the Wall Design Engineer at the Owner's Geotechnical Engineer's direction.

3.2 DESIGN

A. The design analysis for the final, P.E.-stamped retaining wall plans prepared by the Wall Design Engineer shall consider the external stability against sliding and overturning, internal stability and facial stability of the reinforced soil mass, global stability, and shall be in accordance with acceptable engineering practice and these specifications. The internal, external, and global stability analysis shall be performed in accordance with the "NCMA Design Manual for Segmental Retaining Walls, 3rd Edition" using the recommended minimum factors of safety in this manual.

B. External stability analysis for bearing capacity and total and differential settlement shall be the responsibility of the Owner and the Owner's Geotechnical Engineer. The Geotechnical Engineer shall perform bearing

capacity and settlement estimates based on the final wall design provided by the Wall Design Engineer and coordinate any required changes with the Wall Design Engineer.

C. While vertical spacing between geogrid layers may vary, it shall not exceed 2.0 feet maximum in the wall design, if determined required by the Wall Design Engineer.

D. The geosynthetic placement in the wall design shall have 100% continuous coverage parallel to the wall face. Gapping between horizontally adjacent layers of geosynthetic (partial coverage) will not be allowed.

PART 4 CONSTRUCTION

4.1 INSPECTION

A. The Owner is responsible for verifying that the materials supplied by the Contractor meet all the requirements of the specification. This includes all submittals for materials and design, qualifications and proper installation of wall system.

B. Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work at the site.

4.2 EXCAVATION

A. Contractor shall excavate to the lines and grades shown on the project grading plans. Contractor shall take precautions to minimize over-excavation. Over-excavation shall be filled with compacted infill material, or as directed by the Wall Design Engineer, at the Contractor's expense.

B. Contractor shall verify location of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures are protected from the effects of wall excavation. Excavation support, if required, is the responsibility of the Contractor.

4.3 FOUNDATION PREPARATION

A. Following the excavation, the foundation soil shall be examined by the Owner's Engineer to assure actual foundation soil strength meets or exceeds the assumed design bearing strength. Soils not meeting the required strength shall be removed and replaced with infill soils, as directed by the Owner's Geotechnical Engineer.

B. Foundation soil shall be proof-rolled and compacted to 95% standard Proctor density and inspected by the Owner's Geotechnical Engineer prior to placement of leveling pad materials.

4.4 LEVELING PAD CONSTRUCTION

A. Leveling pad shall be placed as shown on the final, P.E.-sealed retaining wall plans with a minimum thickness of 6 inches. The leveling pad should extend laterally at least a distance of 6 inches from the toe and heel of the lowermost SBRW unit.

B. Granular leveling pad material shall be compacted to provide a firm, level bearing surface on which to place the first course of units. Well-graded sand can be used to smooth the top 1/4 inch to 1/2 inch of the leveling pad. Compaction will be with mechanical plate compactors to achieve 95% of maximum standard Proctor density (ASTM D 698).

4.5 SBRW UNIT INSTALLATION

A. All SBRW units shall be installed at the proper elevation and orientation as shown on the final, P.E.-sealed wall plans and details or as directed by the Wall Design Engineer. The SBRW units shall be installed in general accordance with the manufacturer's recommendations. The specifications and drawings shall govern in any conflict between the two requirements.

B. First course of SBRW units shall be placed on the leveling pad. The units shall be leveled side-to-side, front-to-rear and with adjacent units, and aligned to ensure intimate contact with the leveling pad. The first course is the most important to ensure accurate and acceptable results. No gaps shall be left between the front of adjacent units. Alignment may be done by means of a string line or offset from base line to the back of the units.

C. All excess debris shall be cleaned from top of units and the next course of units installed on top of the units below.

D. Two VERSA-Tuff connection pins shall be inserted through the pin holes of each upper-course unit into receiving slots in lower-course units. Pins shall be fully seated in the pin slot below. Units shall be pushed forward to remove any looseness in the unit-to-unit connection.

E. Prior to placement of next course, the level and alignment of the units shall be checked and corrected where needed.

F. Layout of curves and corners shall be installed in accordance with the wall plan details or in general accordance with SBRW manufacturer's installation guidelines. Walls meeting at corners shall be interlocked by overlapping successive courses.

G. Procedures C. through F. shall be repeated until reaching top of wall units, just below the height of the cap units. Geosynthetic reinforcement, drainage materials, and reinforced backfill shall be placed in sequence with unit installation as described in Section 4.06, 4.07 and 4.08.

4.6 GEOSYNTHETIC REINFORCEMENT PLACEMENT

A. All geosynthetic reinforcement shall be installed at the proper elevation and orientation as shown on the final P.E.-sealed retaining wall plan profiles and details, or as directed by the Wall Design Engineer.

B. At the elevations shown on the final plans, (after the units, drainage material and backfill have been placed to this elevation) the geosynthetic reinforcement shall be laid horizontally on compacted infill and on top of the concrete SBRW units, to within 1 inch of the front face of the unit below. Embedment of the geosynthetic in the SBRW units shall be consistent with SBRW manufacturer's recommendations. Correct orientation of the geosynthetic reinforcement shall be verified by the Contractor to be in accordance with the geosynthetic manufacturer's recommendations. The highest-strength direction of the geosynthetic must be perpendicular to the wall face.

C. Geosynthetic reinforcement layers shall be one continuous piece for their entire embedment length. Splicing of the geosynthetic in the design-strength direction (perpendicular to the wall face) shall not be permitted. Along the length of the wall, horizontally adjacent sections of geosynthetic reinforcement shall be butted in a manner to assure 100% coverage parallel to the wall face.

D. Tracked construction equipment shall not be operated directly on the geosynthetic reinforcement. A minimum of 6 inches of backfill is required prior to operation of tracked vehicles over the geosynthetic. Turning should be kept to a minimum. Rubber-tired equipment may pass over the geosynthetic reinforcement at slow speeds (less than 5 mph).

E. The geosynthetic reinforcement shall be free of wrinkles prior to placement of soil fill. The nominal tension shall be applied to the reinforcement and secured in place with staples, stakes or by hand tensioning until reinforcement is covered by 6 inches of fill.

4.7 DRAINAGE AGGREGATE AND DRAINAGE MATERIAL PLACEMENT

A. Drainage aggregate shall be installed to the line, grades and sections shown on the final P.E.-sealed retaining wall plans. Drainage aggregate shall be placed to the minimum thickness shown on the construction plans between and behind units (a minimum of 1 cubic foot for each exposed square foot of wall face unless otherwise noted on the final wall plans).

B. Drainage collection pipes shall be installed to maintain gravity flow of water outside the reinforced-soil zone. The drainage collection pipe shall be installed at the locations shown on the final construction drawings. The drainage collection pipe shall daylight into a storm sewer or along a slope, at an elevation below the lowest point of the pipe within the aggregate drain. Drainage laterals shall be spaced at a maximum 50-foot spacing along the wall face.

4.8 BACKFILL PLACEMENT

A. The reinforced backfill shall be placed as shown in the final wall plans in the maximum compacted lift thickness of 8 inches and shall be compacted to a minimum of 95% of standard Proctor density (ASTM D 698) at a moisture content within -1% point to +3% points of optimum. The backfill shall be placed and spread in such a manner as to eliminate wrinkles or movement of the geosynthetic reinforcement and the SBRW units.

B. Only hand-operated compaction equipment shall be allowed within 3 feet of the back of the wall units. Compaction within the 3 feet behind the wall units shall be achieved by at least three passes of a lightweight mechanical tamper, plate, or roller.

C. At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing and reinforced backfill to direct water runoff away from the wall face.

D. At completion of wall construction, backfill shall be placed level with final top of wall elevation. If final grading, paving, landscaping and/or storm drainage installation adjacent to the wall is not placed immediately after wall completion, temporary grading and drainage shall be provided to ensure water runoff is not directed at the wall nor allowed to collect or pond behind the wall until final construction adjacent to the wall is completed.

4.9 SBRW CAPS

A. SBRW caps shall be properly aligned and glued to underlying units with VERSA-LOK adhesive, a flexible, high-strength concrete adhesive. Rigid adhesive or mortar are not acceptable.

B. Caps shall overhang the top course of units by 3/4 inch to 1 inch. Slight variation in overhang is allowed to correct alignment at the top of the wall.

4.10 CONSTRUCTION ADJACENT TO COMPLETED WALL

A. The Owner's Representative is responsible for ensuring that construction by others adjacent to the wall does not disturb the wall or place temporary construction loads on the wall that exceed design loads, including loads such as water pressure, temporary grades, or equipment loading. Heavy paving or grading equipment shall be kept a minimum of 3 feet behind the back of the wall face. Equipment with wheel loads in excess of 150 psf live load shall not be operated within 10 feet of the face of the retaining wall during construction adjacent to the wall. Care should be taken by the General Contractor to ensure water runoff is directed away from the wall structure until final grading and surface drainage collection systems are completed.

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SECTION 142100
ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to Electric Traction Elevators.

B. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections

1. Section 033000 - CAST-IN-PLACE CONCRETE:
   a. Lintels, sleeves, anchors, inserts, plates and similar items for elevators.
2. Section 042000 - UNIT MASONRY:
   a. Elevator rail bracket inserts.

C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 055000 - METAL FABRICATIONS for miscellaneous framing and supports for hoisting machines, and for elevator door sills, cants in hoistways made from sheet steel, and elevator pit ladders.
2. Section 051200 - STRUCTURAL STEEL FRAMING for the hoist beams, attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
3. Section 260001 - ELECTRICAL WORK for telephone service to elevators.
4. Section 260001 - ELECTRICAL WORK for electrical service for elevators to and including disconnect switches at machine room door and telephone wiring to elevator.
5. Section 312000 - EARTH MOVING for excavation to accommodate elevator pit.

D. Proprietary equipment and controls shall not be utilized; the intent of the documents should be to provide the facility with control systems that are generic to the extent that they can be serviced by other Contractor's qualified mechanics. Consequently, all diagnostics must be built into the controller. Should the Contractor's design require hand held or other external diagnostic tools or keyboards, the Contractor shall furnish to the owner, those tools, training and other operating manuals for them PRIOR TO TEMPORARY APPROVAL FOR OCCUPANCY. The diagnostic tool shall be a "Full Service" tool capable of all levels of diagnostics. The diagnostic tool shall not be designed with decaying circuitry, which requires periodic reprogramming. All service tools, terminals and devices shall become the Owner's property. The Contractor shall provide all required codes and/or passwords to gain access to the diagnostic systems and to recall faults. The manufacturer shall furnish all bulletins, modifications, and technical notices pertaining to the control equipment for at least ten years following completion of the last elevator.

1.2 DEFINITIONS

A. Definitions in ASME A17.1 apply to work of this Section.

B. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.3 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:

1. Car enclosures and hoistway entrances.
2. Operation, control, and signal systems.
3. Traveling cable make-up, conductor count and color coding assignments.
4. Fastenings and other pertinent information.

B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, control room layouts, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control station and standby power operation control panel. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch-square samples of sheet materials; and 4-inch lengths of running trim members.

D. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

E. Qualification Data: Elevators shall be installed by the Manufacturer, using manufacturer certified technicians with experience installing the same model equipment. Installation crew foreman shall have a minimum of three years experience managing installation crews for the same model equipment. Provide supporting information for each installing technician and foreman.

F. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals. Provide three sets, each in a ring-type binder.

G. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

H. Warranty: Special warranty specified in this Section.

I. Continuing Maintenance Proposal: Service agreement specified in this Section.

J. Provide one of each proprietary service and diagnostic tool and device that is required for ongoing maintenance of the elevators.

K. Provide one drop-key.

L. LEED Submittals: Credit EQ 3: Manufacturers' product data for adhesives, sealants and coatings used on-site, including printed statement of VOC content.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Provide all elevators and all major elevator components, including motor and hoist assemblies, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

C. Regulatory Requirements: Comply with ASME A17.1 and New York State Building Code.

D. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG) and ICC/ANSI A117.1 2009.

E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging.

B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.6 COORDINATION

A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.

B. Coordinate sequence of elevator installation with other work to avoid delaying the Work.

C. Coordinate locations and dimensions of other work relating to elevators including support structures and attachments, pit ladders, sumps, and floor drains in pits;

entrance sub-sills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.
   1. Warranty Period: One year from date of Acceptance.
   2. Labor: All included.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Acceptance, provide one year's full maintenance service by skilled employees of elevator Installer. Include periodic preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
   1. Include 24-hour-per-day, 7-day-per-week emergency callback service and onsite response.

B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date Initial Maintenance Service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering elevators that may be incorporated into the Work include, but are not limited to, the following:

   1. Basis of Design: Thyssen Krupp Synergy 3500, self-supported machine room less elevator, or approved equal.

2.2 PASSENGER ELEVATORS

A. Elevator: See Drawings for travel distance, opening locations and stops required.

   1. Type: Machine-room-less, self-supporting electric traction elevator as listed in section 2.1.A above.
   2. Machine Location: Inside top of hoistway.
   3. Controller Location: Fourth floor Room 416.
   4. Rated Load: 3500 Lbs.

5. Rated Speed: 150 FPM
6. Operation System:
   a. Simplex
7. Auxiliary Operations and Features:
   a. Provide fan and light, keyed on and off.
   b. Provide standby power operation for elevator, run by back-up generator.
   c. Provide Independent service, keyed on and off.
   d. Provide loaded-car bypass.
   e. Provide automatic dispatching of loaded car.
   f. Provide top of car inspection.
   g. Provide access at bottom landing with zoning.
   h. Provide access at top landing with zoning.
   i. Provide key switches in addition to hall call buttons, as noted elsewhere.
   j. Provide Remote Elevator Monitoring ready equipment.
8. Car Enclosures sizes as follows:
   a. Clear Inside Cab Dimensions: 6'-8" wide x 5'-5 ½" deep.
   b. Nominal Cab Height: 8'-4"
   c. Clear Height Under Suspended Ceiling Inside Cab: 7' 2".
9. Hoistway Entrances: Provide one opening stop per floor, as follows:
   a. Provide 42" clear opening width.
   b. Provide 80" clear height.
   c. Provide offset, two-speed side sliding doors.
   d. Provide frames of satin stainless steel.
   e. Provide doors of satin stainless steel.
   f. Provide aluminum sills.
10. Hall Fixtures: Satin stainless steel.
11. Additional Requirements: As follows:
   a. Provide inspection certificate in each car, mounted under a polycarbonate cover with satin stainless-steel frame and security head screws.
   b. Provide one complete sets of full-height blankets. Provide protective blanket support system that does not require permanently installed blanket hooks or posts in elevator cars.
   c. Provide traveling cable with 10% redundancy for all normally used conductors. Provide (1) redundant 120 VAC power cable.
   d. Provide traveling cable with minimum (2) two redundant Cat 6 cables and (4) redundant twisted pair cables, for possible future in-Car CCTV (or similar) monitoring system components.
   e. Provide 6'-8" high opening at door openings.

B. Elevator Performance:
   1. Car Speed: $\pm$ 3 % of contract speed under any loading condition or direction of travel.
   2. Car Capacity: Safely lower, stop and hold up to 125% of rated load. (code required)

C. Ride Quality:
   1. Vertical Vibration (maximum): 12 – 17 milli-G
   2. Horizontal Vibration (maximum): 10 – 15 milli-G
   3. Vertical Jerk (maximum): 4.6 ± 1.0 ft./sec^3 (1.4 ± 0.3 m/sec^3)
   4. Acceleration/Deceleration (maximum): $2.6 \pm .33$ ft./sec^2 (0.8 ± 0.13 m/sec^2)

5. In Car Noise: 50 – 55 dB(A)
6. Stopping Accuracy: ± 0.2 in. (± 5 mm)
7. Re-leveling Distance: ± 0.25 in. (± 10 mm)

2.3 SYSTEMS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered elevator systems and as required for complete system.

B. Inserts: Furnish required inserts, brackets and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section. Coordinate all such devices with the structural system and coordinate delivery to ensure timely construction sequencing.

C. Car Frame and Platform: Welded steel units.

D. Provide standard railings complying with ASME A-17.1 on car tops, where required by ASME A-17.1.

E. Guides: Provide roller guides at top and bottom of car and counterweight frames.

F. Suspension Means: 8mm solid core steel cables.

G. Low-Emitting Adhesives, Sealants, Paints and Caulking: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with VOC limits established in Section 018113 - Sustainable Design.

2.4 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system for each elevator as required to provide type of operation system indicated.

B. Single-Car Auxiliary Operations: In addition to primary operation system features, provide the following operational features for all single elevators:
   1. Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at the Security Control Center. Manual operation causes automatic operation to cease.
   2. Express Priority Service (EPS): Service is initiated by a keyswitch at designated floors. The elevator is directed to the floor where service was initiated. On arriving at the floor, elevator opens its doors and parks and a lighted sign directs passengers to exit elevator. Car is placed in operation by selecting a floor and pressing door close button (or by operating the EHS keyswitch, see below). After responding to floor selected car is returned to normal operation. If car is not placed in operation within a preset time after being called it is returned to normal operation. EPS does not override Firefighters' Service Phase I.

C. Seismic Performance: Provide material and equipment to comply with Seismic Performance Category C and governing code requirements.

2.5 DOOR RE-OPENING DEVICES

A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

B. Door Control Features:
1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.
3. Primary door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches (33 mm) in diameter when inserted between the car doors at vertical positions from within 1 inch (25 mm) above the sill to 71 inches (1800 mm) above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4" (100 mm) in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4" object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.
4. The door reopening device shall also include a secondary, three dimensional, triangular infrared multi-beam array projecting across the door opening and extending into the hoistway door zone. The door opening device will cause the doors to reopen when it detects a person(s) or object(s) entering or exiting the car in the area between the hoistway doors or the entryway area adjacent to the hoistway doors.
5. The size of the secondary protection zone shall vary as the door positions vary during opening and closing. The width of the zone shall be approximately one-third the size of the separation between the doors (or door and strike plate for single-slide doors) and shall be approximately centered in the door separation. In order to minimize detection of hallway passers-by who are not entering the elevator, the maximum zone penetration into the entryway shall not exceed 20" for any door separation. Normal penetration depth into the entryway from the car doors shall be ~14" for a door separation of 42". The penetration shall reduce proportionally as the doors close. At door separations of 18" or less the secondary protection system may cease its normal operation since the depth of the zone recedes to where it is inside the hoistway doors. The vertical coverage of the secondary protection shall be ~19" (480 mm) above the sill to ~55" (1400 mm) above the sill (mid-thigh to shoulder of a typical adult).
6. The secondary protection shall have an anti-nuisance feature that will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone; i.e. a person/object is in the entryway but does not

enter. Normal secondary protection shall be re-enabled whenever detection occurs in the primary zone.

7. The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled.
8. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

2.6 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 441.

C. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

2.7 CAR ENCLOSURES

A. Materials and Finishes: Provide satin stainless steel for all exposed surfaces, except as otherwise specifically noted:

1. Provide subfloors of underlayment grade, exterior plywood, 5/8-inch nominal thickness, prepared to receive resilient flooring specified in Section 096519 - RESILIENT TILE FLOORING.
2. Provide car interiors of full height vertical plastic laminate finish panels, with stainless steel bumper rails at bottom.
3. Provide cars with recesses and cutouts for signal equipment.
4. Provide car door frames integrally with front wall of car.
5. Provide satin stainless-steel doors of flush, hollow-metal construction.
6. Provide sight guards on car doors matching door edge color.
7. Provide extruded aluminum sills with grooved surface, 1/4 inch thick.
8. Provide manufacturer's standard satin stainless steel solid bar handrails meeting code requirements. Provide flat, rectangular, solid, 1-1/2” high x 1/2” thick rails with standard attachments.
9. Provide polished stainless steel car fixtures.
10. Provide luminous polycarbonate suspended ceilings. Acrylic panels will not be accepted. Provide tamper resistant fasteners and restraints for all panels and tracks.

2.8 HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, two-speed, offset door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction types and thicknesses.

B. Set sills in factory-packaged, nonshrink, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C-1107.

2.9 SIGNAL EQUIPMENT

A. Hall Call Stations: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life LEDs. Provide all controls of permanent, non-yellowing, translucent, vandal resistant materials and design. See drawings in Appendix A for typical layouts.
   1. Provide an illuminated signal marked “ELEVATOR EMERGENCY POWER” at Entry Lobby 109 to indicate the normal power supply has failed and the emergency power is in effect

B. Car Control Stations: Provide manufacturer's standard recessed, applied car operating control stations. Mount in return panel adjacent to car door, unless otherwise indicated.

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed phone number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is installed behind car operating control panel, with identification, instructions for use, and battery backup power supply.

D. Car Position Indicator: Provide illuminated, digital-type car position indicator, located at top of car control station. Provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows.

E. Hall Push-Button Stations: Provide one hall push-button station at each landing for each single elevator or group of elevators. See drawings for layouts at each landing.

F. Hall Lanterns and Chimes: Provide units with illuminated directional arrows indicating current elevator travel direction and digital illuminated numerals indicating current floor location. Provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down. At manufacturer's option, audible signals may be placed on each car, provided they are clearly audible in elevator lobbies at each floor. Provide satin stainless wall-mounted units adjacent to entrance frames. See drawings for typical design and locations.

G. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical

dimensions and examine supporting structure and other conditions under which elevator work is to be installed.

1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

B. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby eliminate sources of structure-borne noise from elevator system.

C. Lubricate operating parts of systems as recommended by manufacturers.

D. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

E. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.

F. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

G. Locate hall signal equipment for elevator as follows, unless otherwise indicated:
1. Place hall lantern beside hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

B. Advise the Owner, DASNY Project Manager, the Designer, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.
1. The contractor shall arrange inspection with DASNY's elevator inspection firm.

C. Provide one Fire Alarm pre-test.

D. Provide one State Certification pre-test.

E. Provide one Standby power test and demonstration

3.4 PROTECTION

A. Temporary Use: Elevator shall not be used for temporary use.
   1. Provide strippable protective film on entrance and car doors and frames.

3.5 DEMONSTRATION

A. Provide a factory-authorized service representative to train Owner's maintenance personnel and local Fire Department personnel in elevator operations and signals. Provide one trainer for one 8-hour Training Session for up to 12 trainees.

B. Check operation of elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly. This check shall be completed and accepted PRIOR to the Training Session.

PART 4 - APPENDIX A – CONTROL and SIGNAL PANELS:

4.1 GENERAL

A. All controls will comply with ASME A17.1 and New York State Building Code.

B. PART 4 illustrates control concepts. PART 4 does not illustrate definitive fonts, arrow shapes, button styles, button arrangement, sizes, etc. These features may vary among manufacturers. Provide manufacturer's standard devices in all cases.

4.2 CONTROL COMPONENTS AND FUNCTIONS

A. HALL CALL STATIONS
   1. Each elevator has a single Hall Call Station on each floor.
   2. Each Hall Call Station on commonly visited floors (Basement, Entry, 1, 2, 3, 4) provides standard push call buttons to summon a car.
      a. Uppermost floor provides only a "DOWN" call button.
      b. Lowermost floor provides only an "UP" button.
      c. Intermediate floors provide both "UP" and "DOWN" buttons.
   3. Each Hall Call Station at Entry and Ground Floor Levels only provides a keyed FIRE RECALL call switch, with signage. The Entry and Ground Levels are the Main Fire Service Floor for all elevators.
   4. Each Hall Call Station on all floors, for all elevators provides a keyed Express Priority Service (EPS) call switch.

B. CAR CONTROL PANELS
   1. Each Car Control Panel provides standard push buttons for travel to commonly visited floors (B, Entry, 1, 2, 3, 4). All buttons are appropriately marked, light when selected, and are marked by both Arabic and Braille numerals.
   2. Each Car Control Panel provides push buttons as follows:
      a. Door Open Button

b. Door Close Button
c. Alarm Button
d. Telephone Press-to-Call Button, with adjacent ambient microphone. This is for in-house communications only, and should be set to automatically call the RA Desk. If that location is not staffed at any time (full 24/7/365), the calls must be routed automatically to another staffed location, whether on-site or off-site (Campus Public Safety has been identified as a secondary location for receipt of various emergency notifications.)

3. Each Car Control Panel provides keyed switches as follows:
   a. Inspection, On-Off
   b. Fan, On-Off
   c. Light, On-Off
   d. Independent Service, On-Off
   e. Elevator Operation, On-Off
4. Each Car Control Panel provides:
   a. A concealed speaker for the telephone and emergency annunciation.
   b. A Inspection Certificate holder.
   c. A numerical floor position indicator.
   d. A lit arrow indicating direction of travel.
   e. An audible signal indicating floor by-pass, floor arrival, and floor location.

C. SIGNAGE and ALARMS
1. All signage will comply with ASME and New York State Building Code.
2. Elevator is connected to the Fire Alarm System. Detectors are provided outside each elevator entrance and in the elevator control room. Upon activation of a detector, the elevator is sent to the main fire service landing (Entry level). If the detector at the main fire service landing activates, then the elevator is sent to the alternate fire service landing. When this occurs, a light in the car illuminates, showing that the car is on fire service and to exit the car when the doors open. Smoke detector in the third floor lobby and top of the hoistway where control panel is located, shall initiate recall and shall flash the firefighters hat intermittently in the car.

D. DRAWINGS:
1. The following page illustrates the control system described. It does not represent exact designs, definitive fonts, arrow shapes, button styles, button arrangement, sizes, etc. These features may vary among manufacturers. Provide manufacturer's standard devices in all cases. The Entry level call station shall include phase I recall key switch.

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SECTION 144200
WHEELCHAIR LIFT

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Wheelchair lift.

1.2 QUALITY ASSURANCE

A. Products furnished will comply with the requirements of ICC/ANSI A117.1- 2009, Section 1007.5 of New York State building Code ASME A18.1 – 2008 Wheelchair Lifts.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions.

B. Shop Drawings: Submit shop drawings and control wiring diagrams.

C. Manufacturer's Certification: Submit letter form of Certification relative to compliance standards itemized in Article 14.42.3(B).

D. Operation and Maintenance Instructions: Submit manufacturer's written operation and maintenance instructions.

E. Manufacturer's Warrantee: Unit shall have a one (1) year limited warranty on the basic unit and electrical system components with a two (2) year limited warranty on drive components.

F. LEED Submittals: Credit EQ 3: Manufacturers' product data for adhesives, sealants and coatings used on-site, including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Proprietary equipment shall not be used.

B. Basis of Design: Wheelchair Lift: Vertical Platform Lift, Model V-1504 (90º side access SA, Platform 36 x 60") as manufactured by Savaria or accepted equal.
   1. Rated Load: 750 pound capacity.
   2. Travel Speed: 20 feet per minute.
   3. Lifting Height: Maximum 23 feet.
   4. Platform shall be constructed of 12 gauge minimum zinc clad steel. Platform must have a non-skid surface. The platform shall have a minimum of 12 square feet.
   5. Platform side panels shall be 42" high. Side panel framework shall be a minimum of 1 x 1-1/2 x .065 tubing. The solid infill panels shall be a minimum of 24 gauge zinc clad steel.
   6. The main frame support tubings shall be a minimum of 1-1/2 square tubing x .120.

7. Carriage arms shall be a minimum of 1/2" x 2" steel flatbar along with 1/2" x 3-1/2" steel flatbar uprights. Cam rollers shall be used for axial carriage guidance and wear resistance pads for horizontal stability.
8. Fasteners shall be grade five or higher. Locking fasteners shall be used in all critical locations.
9. The machine tower sides shall be of 12 gauge steel, front and back covers of a minimum of 18 gauge zinc clad steel.
10. The drive mechanism shall be 2:1 roller chain hydraulic.
11. The drive mechanism shall have a minimum static load rating of five (5) times the rated lifting capacity.
12. The drive shall be an instant reversing motor with a minimum of 1 HP capacity.
13. The operating control circuit shall be 24 volts with a grounded electrical system.
14. A final limit switch shall be required to cut off all power and stop the unit in the event of an upper limit switch failure.
15. Finish shall be electrostatically applied powder coating oven baked to cure.
16. Color shall be selected from manufacturers' standard color.
17. The lift shall be supplied with a constant pressure up/down switch which is keylocked and shall meet the requirements of ANSI A18.1.
18. The lift shall be designed such that it comes to a gradual stop within 1/8" of desired lifting height.
19. The platform shall be equipped with an obstruction panel that will stop the downward travel if an obstruction is encountered.
20. An emergency stop and alarm switch shall be provided on the car as a means of signaling for assistance in the event of an emergency.
21. Provide a grab rail that complies to ASME A18.1 on the platform as required by ASME A18.1 for commercial applications.
22. A manually operated down valve shall be provided as a means of manually raising and lowering the platform in the event of a power or component failure.
23. Provide an electric strike allowing the door to be interlocked to unit. The strike should be a 24V DC, fail secure unit that contains electric contacts to ensure door is both closed and locked. Door and all other door hardware to be provided by Division 8.

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to commencing, verify all critical dimensions and examine supporting structure and all other conditions under which work is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations for work required during installation.

B. Coordination: Coordinate elevator work with work of other trades for proper time and sequence to avoid construction delays. Use benchmarks, lines and levels designated by Contractor to ensure dimensional coordination of the work.

C. Electrical Coordination: Control wiring for the complete operation of wheelchair lifts will be provided by this Section in accordance with Division 26 requirements. Power wiring will be provided by Division 26.

D. Proximity Reader Cooridnation: Lift call buttons outside of the lift shall be activated by the adjacent proximity reader. Coordinate with Division 28.

E. Lubricate operating parts of system as recommended by manufacturers.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon nominal completion of installation and before permitting use (either temporary or permanent), perform acceptance tests as required and recommended by Code and by governing regulations or agencies.

B. Advise Owner, DASNY Project Manager, Architect and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.
   1. The contractor shall arrange inspection with DASNY's elevator inspection firm.

3.4 PROTECTION

A. At time of Substantial Completion provide suitable protective coverings, barriers, devices, signs or such other methods or procedures to protect work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.5 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations and maintenance. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Owner on requirements for a complete maintenance program.

B. Make a final check of operation with Owner's personnel present at the time of Substantial Completion. Determine that control systems and operating devices are functioning properly.

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SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, and spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SCOPE OF WORK

A. The Work of this Contract includes providing all labor, materials, accessories, services and tests necessary to install, complete and make ready for operation by the Owner, all work as shown on the Drawings and as specified hereinafter.

1.4 REQUIREMENTS

A. All tests shall be made in the presence of the Architect or their representatives, and the local authorities having jurisdiction of the work to be tested, as may be directed; and at least 72 hours notice shall be given in advance of all tests.

B. The Work of this Contractor shall include the furnishing of all testing instruments, gauges, pumps, smoke machines, and other equipment required or necessary for tests, required by laws, rules and regulations and as specified.

C. Provide all other tests required by local inspectors and all other authorities having jurisdiction.

D. All appurtenances shall be operated after installation to determine whether or not they meet the requirements of the Specifications.

E. All defects disclosed in the work by tests and otherwise shall be made good or the Work replaced without additional cost to the Owner. No caulking on screwed joints, cracks or holes will be acceptable.

F. Tests shall be repeated after any defects disclosed thereby have been made good or the work replaced if it is deemed necessary.

G. All tests shall be made at the expense of the Contractor.

H. Tests are not permitted to be made with air except as noted.

I. Contractor to provide required test plug tee fittings during erection of pipe system.

J. If the pipe installation fails to meet testing requirements, the Contractor shall determine at his own expense the source or sources of leakage, and he shall repair or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of the tests after the leaks have been corrected.

K. All piping which is to be enclosed in partitions or hung ceilings shall be tested and made tight when directed by the Construction Supervisor and in adequate time to permit the installation of partitions and ceilings. When necessary, the Contractor shall drain the piping and/or take over such precautions as required to prevent damage by freezing.

L. The Contractor shall also be responsible for the Work of other trades that may be damaged or disturbed by the tests, or the repair or replacement of his Work, and he shall, without extra charges, restore to its original condition any Work so damaged or disturbed.

1.5 UNDERGROUND WATER PIPING

A. The new fire service shall be given pressure and leakage tests in section of approved length all as directed and approved by the Architect. Hydrostatic and leakage tests shall conform to AWWA C600-64 requirements and shall be in compliance with NFPA 13. For these tests, this Contractor shall furnish a water meter and a pressure gauge. This Contractor shall furnish and install suitable temporary testing plugs, valves or caps for the pipeline, all necessary pressure pumps, pipe connections, other similar equipment, and all labor required. All expenses involved in making leakage and pressure tests shall be borne by this Contractor. The meter gauge shall be installed by this Contractor in such a manner that all water entering the section under test will be measured and the pressure in the section indicated, and shall be kept in use during both tests. The Sections of pipe to be tested shall be filled with water of approved quantity and all air shall be expelled from the pipe.

B. The new water main shall be subject to a hydrostatic test of 200 psi gauge, after the pipe is laid and the trench partially backfilled (joints shall be left exposed). The test pressure shall be applied and maintained for a period of two (2) hours with no more than 2 psi loss or pressure. If this Contractor cannot achieve the specified pressure and maintain it for a

period of two (2) hours, the section under test shall be considered as having failed to pass the pressure test.

C. If the section tested shall fail to pass the pressure test or the leakage test, or both, this Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, joint, etc., without extra cost to the Owner.

D. If, in the judgment of the Architect, it is impractical to follow the foregoing procedures exactly for any reason, required modifications in procedure shall be made, but in any event, this Contractor shall be responsible for the ultimate tightness of the lines within the above leakage requirements.

1.6 SPRINKLER SYSTEM

A. Before any paint is applied, the sprinkler system shall be tested hydrostatically at not less than 200 psi pressure for two (2) hours minimum, and in accordance with all requirements of the authorities having jurisdiction and NFPA.

1.7 The test shall be made in the presence of the Building and Fire Department Inspectors, and all other authorities having jurisdiction, and to their satisfaction

1.8 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

1.9 FIRE-DEPARTMENT CONNECTION INSTALLATION

1. Install two protective pipe bollards on sides of each fire-department connection. Comply with requirements for bollards in Division 05 Section "Metal Fabrications."

B. Install automatic (ball drip) drain valve with drain pipe routed to exterior at each check valve for fire-department connection.

1.10 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

C. Provide signage got all equipment including sprinkler alarm bell, hydraulic data plate, etc.

1.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter. Verify flushing of underground pipe prior to connection.

4. Energize circuits to electrical equipment and devices.

5. Start and run excess-pressure pumps.

6. Coordinate with fire-alarm tests. Operate as required.

7. Coordinate with fire-pump tests. Operate as required.

8. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

1.12 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

1.13 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves and pressure-maintenance pumps.

1.14 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Solvent Cements for Joining CPVC Plastic Piping: ASTM F 493.

2.3 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Carbon steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Under deck Clamp: Clamping ring with set screws.

E. PVC Pipe: ASTM D 1785, Schedule 40.

F. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.5 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated and rough brass.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons for penetrations of walls, ceilings, and floors.

L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

M. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

N. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Coordinate inspection of required welder's stamp/identification of shop welded pipe with owner prior to installation. Coordinate inspection of required welder's stamp/identification of field welded pipe with Owner as work progresses, prior to enclosure.

I. Firestop all joints, penetration within rated construction in compliance with the specification section 078400.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.4 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor fire-suppression materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

END OF SECTION 210500

SECTION 210517
SLEEVES AND SLEEVE SEALS FOR FIRE SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Where sleeves penetrate waterproofing, install caulking between pipes and pipe sleeves as follows:

1. Provide waterproof mechanical seal such as link-seal or equal, see details for more information.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Advance Products & Systems, Inc.

2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

C. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6 Cast-iron wall sleeves.
b. Piping NPS 6 and Larger: Cast-iron wall sleeves

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system with.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe.
b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger.

END OF SECTION 210517

SECTION 210518
ESCUTCHEONS FOR FIRE SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 210518

SECTION 21 05 53
IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

D. Valve Schedules: Valve numbering scheme.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each piping system to include in maintenance manuals.

PART 2 -PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: aluminum, 0.032 inch or anodized aluminum, 0.032 inch thick, with predrilled holes for attachment hardware.
2. Letter Color: Black

3. Background Color: Red

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

6. Fasteners: Stainless-steel rivets or self-tapping screws.

7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

2. Letter Color: Black

3. Background Color: Red

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

7. Fasteners: Stainless-steel rivets or self-tapping screws.

8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

B. Letter Color: Black

C. Background Color: Yellow

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; pipe size; and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

E. Pipe-Label Colors:

1. Background Color: Red.

2. Letter Color: White.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.

1. Tag Material: aluminum, 0.032 inch or anodized aluminum, 0.032 inch thick, with predrilled holes for attachment hardware.

2. Fasteners: Brass wire-link chain or S-hook.

3. Valve-Tag Color: Red.

4. Letter Color: White.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches

2. Fasteners: Reinforced grommet and wire or string.

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Yellow background with black lettering.

PART 3 -EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 LABEL INSTALLATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install or permanently fasten labels on each major item of mechanical equipment.

D. Locate equipment labels where accessible and visible.

E. Retain "Piping Color-Coding" Paragraph below to identify piping systems by color-coded painting. Labels are required to identify service, pipe size, and flow direction.

F. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 12 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.3 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

1. Valve-Tag Size and Shape:

a. Fire-Suppression Standpipe: 2 inches, round

b. Wet-Pipe Sprinkler System: 2 inches, round

c. Dry-Pipe Sprinkler System: 2 inches, round

3.4 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 210553

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SECTION 211313
WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.
7. Backflow preventer

1.2 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated. Wet-Pipe Sprinkler system shall be in compliance with NFPA 13 throughout building with exception of café and utility spaces outside dwelling units which require NFPA 13 sprinkler system.

1.3 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria as indicated on drawings.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:
   a. Resident Rooms: Light Hazard.
   b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
   c. General Storage Areas: Ordinary Hazard, Group 1.

d. Laundries: Ordinary Hazard, Group 1.

e. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.

f. Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.

b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft.

4. Maximum Protection Area per Sprinkler: Per UL listing.

5. Maximum Protection Area per Sprinkler:

a. Resident Rooms: 225 sq. ft.

b. Storage Areas: 130 sq. ft.

c. Mechanical Equipment Rooms: 130 sq. ft.

6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:

a. Ordinary-Hazard Occupancies: 250 gpm.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For qualified Installer and professional engineer.

E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

G. Field quality-control reports.

H. Operation and maintenance data.

I. A set of finalized hydraulic calculations.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13 (2013), "Standard for the Installation of Sprinkler Systems"

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA-13.

2.2 PIPE AND FITTINGS

A. Steel Pipe: ASTM A 795 Schedule 10, ASTM A 53 Schedule 40, or ASTM A 135/A 13M Schedule 10, black (2" and under – Schedule 40, threaded fittings; 2½" and above – Schedule 10, grooved fittings). For use in all areas where piping is exposed, including but not limited to, stairways, attic, mechanical rooms, electrical rooms, janitor's closets, and all other areas without ceilings.

1. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.

2. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers.

B. CPVC Pipe: ASTM F 442/F 442M, SDR 13.5. UL listed for use in sprinkler systems. BlazeMaster or approved equal. For use inside soffits or concealed above ceilings, sizes 2" and under only.

1. Fittings: ASTM F 438 Schedule 40, or ASTM F 439 Schedule 80, CPVC.

2. Adapters: Provided listed CPVC adapter fittings with integral metal inserts for connections to sprinklers as indicated. Nibco or approved equal. Provided listed adapters to transition from steel to CPVC.

3. Joints: Solvent welded, using ASTM F 493 cement.

4. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Anvil International, Inc.

b. Corcoran Piping System Co.

c. National Fittings, Inc.

d. Shurjoint Piping Products.

e. Tyco Fire & Building Products LP.

f. Victaulic Company.

2.3 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.

2. Minimum Pressure Rating: 175 psig.

B. Check Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Crane Co.; Crane Valve Group; Jenkins Valves.

d. Crane Co.; Crane Valve Group; Stockham Division.

e. Fire-End & Croker Corporation.

f. Fire Protection Products, Inc.

g. Globe Fire Sprinkler Corporation.

h. Groeniger & Company.

i. Kennedy Valve; a division of McWane, Inc.

j. Milwaukee Valve Company.

k. Mueller Co.; Water Products Division.

l. NIBCO INC.

m. Potter Roemer.

n. Reliable Automatic Sprinkler Co., Inc.

o. Tyco Fire & Building Products LP.

p. United Brass Works, Inc.

q. Victaulic Company.

r. Viking Corporation.

s. Watts Water Technologies, Inc.

2. Standard: UL 312.

3. Pressure Rating: 250 psig minimum.

4. Type: Swing check.

5. Body Material: Cast iron.

6. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves (2 inches and smaller):

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. Milwaukee Valve Company.

d. NIBCO INC.

e. United Brass Works, Inc.

2. Standard: UL 262.

3. Pressure Rating: 175 psig .

4. Body Material: Bronze.

5. End Connections: Threaded.

D. Iron OS&Y Gate Valves (2½ inches and larger):

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.

b. American Valve, Inc.

c. Clow Valve Company; a division of McWane, Inc.

d. Crane Co.; Crane Valve Group; Crane Valves.

e. Crane Co.; Crane Valve Group; Jenkins Valves.

f. Crane Co.; Crane Valve Group; Stockham Division.

g. Globe Fire Sprinkler Corporation.

h. Hammond Valve.

i. Milwaukee Valve Company.

j. Mueller Co.; Water Products Division.

k. NIBCO INC.

l. Shurjoint Piping Products.

m. Tyco Fire & Building Products LP.

n. United Brass Works, Inc.

o. Watts Water Technologies, Inc.

2. Standard: UL 262.

3. Pressure Rating: 250 psig minimum.

4. Body Material: Cast or ductile iron.

5. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Anvil International, Inc.

b. Fivalco Inc.

c. Globe Fire Sprinkler Corporation.

d. Kennedy Valve; a division of McWane, Inc.

e. Milwaukee Valve Company.

f. NIBCO INC.

g. Shurjoint Piping Products.

h. Tyco Fire & Building Products LP.

i. Victaulic Company.

2. Standard: UL 1091.

3. Pressure Rating: 175 psig minimum.

4. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.

b. Body Material: Bronze.

c. End Connections: Threaded.

5. Valves NPS 2½ and Larger:

a. Valve Type: Butterfly.

b. Body Material: Cast or ductile iron.

c. End Connections: Flanged, grooved, or wafer.

6. Valve Operation: Integral electrical, 115-V AC, prewired, single-circuit, supervisory switch] indicating device.

2.4 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Minimum Pressure Rating: 175 psig.

B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Affiliated Distributors.

b. Anvil International, Inc.

c. Barnett.

d. Conbraco Industries, Inc.; Apollo Valves.

e. Fire-End & Croker Corporation.

f. Fire Protection Products, Inc.

g. Flowserve.

h. Globe Fire Sprinkler Corporation.

i. Jomar International, Ltd.

j. Kennedy Valve; a division of McWane, Inc.

k. Kitz Corporation.

l. Legend Valve.

m. Metso Automation USA Inc.

n. Milwaukee Valve Company.

o. NIBCO INC.

p. Potter Roemer.

q. Red-White Valve Corporation.

r. Southern Manufacturing Group.

s. Stewart, M. A. and Sons Ltd.

t. Tyco Fire & Building Products LP.

u. Victaulic Company.

v. Watts Water Technologies, Inc.

2.5 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Minimum Pressure Rating: 175 psig .

3. Body Material: Cast or ductile iron.

4. Size: Same as connected piping.

5. End Connections: Flanged or grooved.

B. Alarm Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawing or comparable product by one of the following:

a. AFAC Inc.

b. Globe Fire Sprinkler Corporation.

c. Reliable Automatic Sprinkler Co., Inc.

d. Tyco Fire & Building Products LP.

e. Venus Fire Protection Ltd.

f. Victaulic Company.

g. Viking Corporation.

3. Standard: UL 193.

4. Design: For horizontal or vertical installation.

5. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages and fill-line attachment with strainer.

6. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.

7. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

C. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the:

a. AFAC Inc.

b. Reliable Automatic Sprinkler Co., Inc.

c. Tyco Fire & Building Products LP.

2. Standard: UL 1726.

3. Pressure Rating: 175 psig minimum.

4. Type: Automatic draining, ball check.

5. Size: NPS 3/4.

6. End Connections: Threaded.

2.6 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. AFAC Inc.

b. Elkhart Brass Mfg. Company, Inc.

c. GMR International Equipment Corporation.

d. Guardian Fire Equipment, Inc.

e. Potter Roemer.

3. Standard: UL 405.

4. Type: Flush, for wall mounting.

5. Pressure Rating: 175 psig minimum.

6. Body Material: Corrosion-resistant metal.

7. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.

8. Caps: Brass, lugged type, with gasket and chain.

9. Escutcheon Plate: Rectangular, brass, wall type.

10. Outlet: With pipe threads.

11. Body Style: Horizontal.

12. Number of Inlets: One.

13. Outlet Location: Back.

14. Escutcheon Plate Marking: Similar to "AUTO SPKR."

15. Finish: Polished chrome plated.

16. Outlet Size: NPS 6.

17. Must me local AHJ standards for hose connection type and size.

2.7 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.

b. Globe Fire Sprinkler Corporation.

c. National Fittings, Inc.

d. Shurjoint Piping Products.

e. Tyco Fire & Building Products LP.

f. Victaulic Company.

2. Standard: UL 213.

3. Pressure Rating: 175 minimum.

4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.

5. Type: Mechanical-T and -cross fittings.

6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.

7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.

8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AGF Manufacturing Inc.

   b. Globe Fire Sprinkler Corporation.

   c. Reliable Automatic Sprinkler Co., Inc.

   d. Tyco Fire & Building Products LP.

   e. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

3. Pressure Rating: 175 psig.

4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.

5. Size: Same as connected piping.

6. Inlet and Outlet: Threaded.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

   a. Elkhart Brass Mfg. Company, Inc.

   b. Fire-End & Croker Corporation.

   c. Potter Roemer.

2. Standard: UL 199.

3. Pressure Rating: 175 psig minimum.

4. Body Material: Brass.

5. Size: Same as connected piping.

6. Inlet: Threaded.

7. Drain Outlet: Threaded and capped.

8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

a. AGF Manufacturing Inc.

b. Triple R Specialty.

c. Tyco Fire & Building Products LP.

d. Victaulic Company.

e. Viking Corporation.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

3. Pressure Rating: 175 psig minimum.

4. Body Material: Cast- or ductile-iron housing with sight glass.

5. Size: Same as connected piping.

6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

a. CECA, LLC.

b. Corcoran Piping System Co.

c. Merit Manufacturing; a division of Anvil International, Inc.

2. Standard: UL 1474.

3. Pressure Rating: 250 psig minimum.

4. Body Material: Steel pipe with EPDM-rubber O-ring seals.

5. Size: Same as connected piping.

6. Length: Adjustable.

7. Inlet and Outlet: Threaded.

F. Flexible, Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

a. Fivalco Inc.

b. FlexHead Industries, Inc.

c. Gateway Tubing, Inc.

2. Standard: UL 1474.

3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.

4. Pressure Rating: 175 psig minimum.

5. Size: Same as connected piping, for sprinkler.

2.8 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:

1. AFAC Inc.

2. Globe Fire Sprinkler Corporation.

3. Reliable Automatic Sprinkler Co., Inc.

4. Tyco Fire & Building Products LP.

5. Venus Fire Protection Ltd.

6. Victaulic Company.

7. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating for Residential Sprinklers: 175 psig (1200 kPa) maximum.

3. Pressure Rating for Automatic Sprinklers: 175 psig (1200 kPa) minimum.

4. Pressure Rating for High-Pressure Automatic Sprinklers: 250 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.

2. Nonresidential Applications: UL 199.

3. Residential Applications: UL 1626.

4. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Chrome plated.

2. Bronze.

3. Painted

4. Concealed sprinklers (color subject to architectural approval).

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.

2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

F. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the:

a. Globe Fire Sprinkler Corporation.

b. Reliable Automatic Sprinkler Co., Inc.

c. Tyco Fire & Building Products LP.

d. Victaulic Company.

e. Viking Corporation.

2. Standard: UL 199.

3. Type: Wire cage with fastening device for attaching to sprinkler.

G. See schedule on drawings for basis of design sprinkler heads.

2.9 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm:

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

a. Fire-Lite Alarms, Inc.; a Honeywell company.

b. Notifier; a Honeywell Company.

c. Potter Electric Signal Company.

2. Standard: UL 464.

3. Type: Vibrating, metal alarm bell.

4. Size: 10-inch diameter.

5. Finish: Red-enamel factory finish, suitable for outdoor use.

C. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ADT Security Services, Inc.

   b. McDonnell & Miller; ITT Industries.

   c. Potter Electric Signal Company.

   d. System Sensor; a Honeywell company.

   e. Viking Corporation.

   f. Watts Industries (Canada) Inc.

2. Standard: UL 346.

3. Water-Flow Detector: Electrically supervised.

4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

5. Type: Paddle operated.

6. Pressure Rating: 250 psig.

7. Design Installation: Horizontal or vertical.

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Fire-Lite Alarms, Inc.; a Honeywell company.

   b. Kennedy Valve; a division of McWane, Inc.

   c. Potter Electric Signal Company.

   d. System Sensor; a Honeywell company.

2. Standard: UL 346.

3. Type: Electrically supervised.

4. Components: Single-pole, double-throw switch with normally closed contacts.

5. Design: Signals that controlled valve is in other than fully open position.

2.10 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMETEK; U.S. Gauge Division.

2. Ashcroft, Inc.

3. Brecco Corporation.

4. WIKA Instrument Corporation.

5. Flo Fab.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 250 psig minimum.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

F. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

2.11 REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA)

A. New reduced pressure detector assembly type backflow preventer on fire water supply service to building as indicated on the drawings. NYS and DEP approved.

B. The Reduced Pressure Detector Backflow Prevention Assembly shall be ASSE® Listed 1047, and supplied with full port OS & Y gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTM A 536 Grade 4), the seat ring and check valve shall be NORYL™, the stem shall be stainless steel (ASTM A 276) and the seat disc elastomers shall be EPDM. The checks and the relief valve shall be accessible for maintenance without removing the device from the line.

C. For model number refer to plumbing drawings.

2.12 FLOOD CONTROL INTEGRATED SYSTEM (FCIS)

A. To be installed on incoming fire service before RPDA and connected to BMS for monitoring.

B. The Flood Control Integrated System (FCIS) shall consist of a Reduced Pressure Detector Assembly (RPDA), a Solenoid Control Valve (SCV) (Model ZW206), and an Electric Solenoid Timer (Model EST) and shall be constructed and tested at the factory as a complete assembly. The RPDA shall be certified to NSF/ANSI 372, and shall be ASSE 1013 Listed. The RPDA shall be furnished with full port, resilient seated shut-off valves, and shall be equipped with an integral Relief Valve Monitor Switch that monitors the Relief Valve in a closed position. The seat ring and the check valves shall be Noryl, the stems and springs shall be Stainless Steel, and the elastomers shall be EPDM. The SCV shall be a single seated, line-pressure-operated, diaphragm-actuated, pilot-controlled valve. The

SCV shall seal by means of a corrosion resistant seat and a resilient, rectangular seat disc. The stem of the SCV shall be guided top and bottom by integral bushings, and shall contain no packing glands or stuffing boxes. The SCV shall be protected with internal and external FDA approved epoxy coating, and the diaphragm shall not be used as a seating surface. The EST shall have an input voltage of 120 VAC, and shall be provided with outputs of 24 VAC and 120 VAC controlled by a user adjusted time delay relay. The EST shall be housed in a water-tight fiberglass NEMA enclosure, and shall have both normally open and normally closed outputs. The three components, the RPDA, SVC, and EST, when combined together, automatically shut off the water supply in the event of catastrophic relief valve discharge. The Reduced Pressure Detector Assembly, Solenoid Control Valve, and Electronic Solenoid Timer assembled as a complete unit shall be the Zurn Wilkins FCIS.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping, comply with requirements for backflow preventers in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

D. Verify proper hydrostatic testing and flushing of underground piping prior to connection to underground piping.

3.2 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Division 22 Section "Domestic Water Piping."

B. Install shutoff valve pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

C. Install shutoff valve, pressure gage, and drain at connection to water supply.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to outside building.

J. Install alarm devices in piping systems.

K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

M. Fill sprinkler system piping with water.

N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

D. Provide spare sprinklers and wrenches per NFPA 13 2007 in a cabinet in the fire pump room. See schedule for make and model of all heads used as basis of design.
1. Six (6) SP-1 – With cover plate per architectural direction
2. Six (6) SP-2 – With protective guard
3. Six (6) SP-3 – With cover plate per architectural direction
4. Two (2) SP-4

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.

4. Energize circuits to electrical equipment and devices.

5. Start and run excess-pressure pumps.

6. Coordinate with fire-alarm tests. Operate as required.

7. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Contractor shall submit “Statement of Compliance” for each sprinkler system in accordance with FCNYS 901.2.1 requesting final acceptance test with Authority Having Jurisdiction.

F. Provide NFPA 13 Contractors Material and Test Certificate for Above Ground Piping. Verify submission of NFPA 13 Contractor’s Material and Test Certificate for Below Ground Piping (Coordinate if by others).

3.9 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

END OF SECTION 21 13 13

SECTION 213113
ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

1. This Section includes electric-drive centrifugal fire pumps with controllers, automatic transfer switches and accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Pump, Equipment, Accessory, Specialty, and Piping Pressure Rating: Refer to Schedule.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, certified pump performance curves with each selection point indicated, operating characteristics, and furnished accessories and specialties for each fire pump and pressure-maintenance pump.

B. Shop Drawings: For fire pumps and drivers, fire-pump controllers, fire-pump accessories and specialties, pressure-maintenance pumps, pressure-maintenance-pump controllers, and pressure-maintenance-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Product Certificates - after shipment: Factory certified performance test curves for each fire pump.

D. Operation and Maintenance Data: For fire pumps and drivers, pressure-maintenance pumps, controllers, accessories and specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fire pumps, pressure-maintenance pumps, and controllers through one source from a single manufacturer for each type of equipment.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of fire pumps, pressure-maintenance pumps, and controllers and are based on specific systems indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with standards of authorities having jurisdiction pertaining to materials, hose threads, and installation.

E. Comply with NFPA 20, "Stationary Pumps for Fire Protection," for fire pumps, drivers, controllers, accessories, and their installation.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.7 UNIT RESPONSIBILITY

A. The fire pump manufacturer shall furnish and have unit responsibility for the fire pump, motor, controllers and jockey pump.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with all specified requirements, provide products as produced by the manufacture used as the basis of design. Other manufacturers, whose products have been in satisfactory use in similar service for not less than 10 years, may be submitted for approval as an equal provided the submission contains sufficient information for evaluation and the manufacturer certifies full compliance with the performance, physical characteristic requirements and all operational features of these Specifications.

B. Should the initial "Or, Equal" submittal be incomplete or otherwise fail to demonstrate "Or, Equal" status, no further submissions by the failed manufacturer will be reviewed.

2.2 CENTRIFUGAL FIRE PUMPS

A. Description, General: UL 448, factory-assembled and -tested, electric-drive, centrifugal fire pumps capable of furnishing not less than 150 percent of rated capacity at not less than 65 percent of total rated head and with shutoff head limited to 140 percent of total rated head,

1. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

2. Nameplate: Complete with capacities, characteristics, and other pertinent data.

B. Fabricate bases for fire pumps, pressure-maintenance pumps, and controllers (unless wall mounted) with reinforcement to resist movement of pumps and controllers during a seismic event when their bases are anchored to building structure.

C. Horizontally Mounted, Split-Case Fire Pumps with pump and driver mounted on same base and connected with coupling.

1. Manufacturers:

a. Peerless - GAF Series - Basis of Design

b. Or, Approved equal.

2. Pump: Axially split cast-iron casing with flanges machined to ASME B16.1, Class 125 suction, 250 discharge dimensions, unless otherwise indicated.

a. Impeller: Cast bronze of construction to match fire pump, statically and dynamically balanced, and keyed to shaft.

b. Case Wear Rings: Replaceable, bronze.

c. Shaft and Sleeve: Steel shaft with bronze sleeve.

1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.

2) Seals: Stuffing box to accommodate a minimum of six rings of graphite-impregnated braided yarn and 304 stainless steel split packing gland to extend packing life and facilitate servicing.

d. Suction and discharge flanges shall have 1/4" NPT pressure gauge tappings.

3. Coupling: UL 448A listed, flexible coupling capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.

4. Driver: UL 1004-5 listed, NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.

a. Manufacturers:

1) Baldor Electric Motors

2) Marathon Electric Motors (Regal Beloit Corp.)

3) Nidec Motor Corp. (formerly US Motors)

4) WEG Electric Corp.

D. Fire-Pump Performance Characteristics: Refer to Schedule

2.3 FIRE-PUMP CONTROLLER

A. Fire-Pump Controllers, General: UL 218, NFPA 20; listed for electric-drive, fire-pump service and service entrance, combined automatic and manual operation; factory assembled, wired and factory tested for capacities and electrical characteristics.

1. Firetrol Inc, or approved equal by one or these Manufacturers:

a. Eaton Cutler Hammer, Corp.

b. Master Control Systems, Inc.

2. Rate controllers for scheduled fire-pump horsepower and short-circuit withstand rating as shown below or on the Schedule.

3. Enclosure: UL 50, Type 2, drip-proof, indoor, unless special-purpose enclosure is indicated. Include manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

4. Controls, devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used, and specific items listed.

    a. Voltage surge protection

    b. Isolating means and circuit breaker.

    c. Motor contactors

    d. Emergency run mechanism

    e. "Power on" pilot lamp.

    f. Alarm.

    g. Fire-alarm system auxiliary contacts with two (2) sets for indication of:

        1) pump / motor running, option AC

        2) loss-of-line power / phase failure, option BW

        3) line-power phase reversal.

    h. Solid state pressure transducer.

    i. Controller shall have a password protected operator interface. It shall provide for set point adjustment, display system pressure and 3 phase motor operating conditions.

    j. Controllers shall record historical operating data and system events which may be downloaded to through its USB port and shall be accessible by the building management system through the network ready mod bus protocol.

    k. Automatic and manual operation.

    l. Automatic or manual shutdown with and minimum run-time relay to prevent short cycling.

    m. Low system pressure audible alarm.

    n. Automatic weekly test timer and pressure sensing line drain solenoid valve, pipe to floor drain.

    o. Controller shall monitor, display and data log jockey pump pressure and operation. Contractor to provide Ethernet field wired connection between controllers.

5. Nameplate: Complete with capacity, characteristics, approvals and listings, and other pertinent data.

6. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with nonferrous-metal sensing piping, NPS 1/2 (DN 15), with globe valves for testing controller mechanism from system to pump controller as indicated. Include two (2) bronze check valves with 3/32-inch (2.4-mm) orifice in clapper or ground-face union with noncorrosive diaphragm having 3/32-inch (2.4-mm) orifice.

B. Full-Service Fire-Pump Controllers:

1. Type Starting: Reduced voltage.

2. Mounting: Floor-stand type for field electrical connections.

3. Firetrol Model FTA1930 reduced voltage controller, Short circuit current withstand rating of not less than 100,000 AMPS RMS symmetrical at the operating voltage.

C. Automatic Transfer Switches: Meeting UL 218, UL 1008 and NFPA 20 requirements, transfer switches shall be furnished factory mounted and interwired with the fire pump controllers. Include enclosure complying with UL 50, Type 2, with automatic transfer switch with rating at least equal to fire-pump driver-motor horsepower. Include ampere rating not less than 115 percent of motor full-load current and suitable for switching motor-locked rotor current. The transfer switch shall be electrically operated and mechanically held, and shall be capable of being operated by a manual transfer mechanism located on the switch.

1. The transfer switch shall be Firetrol Model FTA950 suitable for use with emergency power coming from a local electrical distribution panel, second utility feed or an emergency generator. The transfer switch shall be an ASCO 7000 series with group 5 control panel. Furnished with a serial communications port to allow remote monitoring and communication with other transfer switches in the building. The transfer switch short circuit current withstand rating on the normal and emergency power sides shall be the same as the fire pump controller.

2. Fire-alarm system auxiliary contacts:

a. emergency source isolation switch open

b. normal power available

c. emergency power available

3. Designs utilizing components of molded case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

2.4 FIRE-PUMP ACCESSORIES AND SPECIALTIES

A. Match fire-pump suction and discharge ratings as required for fire-pump capacity rating. Include the following:

1. Automatic air-release valve.

2. Circulation relief valve.

3. Suction and discharge pressure gages.

4. Eccentric-tapered reducer at suction inlet.

5. Concentric-tapered reducer at discharge outlet.

6. Test-Header Manifold: Ferrous body for hose valves. Manufacturer's standard finish. Include bronze or cast-iron, exposed-type valve header with nozzle outlets; and round, brass escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."

7. Hose Valves: UL 668, straightway pattern, and bronze with cap and chain. Include NFPA 1963 hose thread that complies with local fire department standards.

8. Ball Drip Valve: UL 1726.

9. Finish: Manufacturer's standard factory-applied red paint unless brass or other finish is specified.

2.5 PRESSURE-MAINTENANCE PUMPS

A. Pressure-Maintenance Pumps, General: Factory-assembled and -tested pumps with electric-motor driver, controller, and accessories and specialties. Include cast-iron or stainless-steel casing and bronze or stainless-steel impellers, mechanical seals, and suction and discharge flanges machined to ASME B16.1, Class 125 dimensions unless Class 250 flanges are indicated and except that connections may be threaded in sizes where flanges are not available.

1. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.

B. Multistage, Pressure-Maintenance Pumps: Multiple-impeller type complying with HI 1.1-1.2 and HI 1.3 requirements for multistage centrifugal pumps. Include base.

1. Peerless Pump Company, or approved equal by one or these Manufacturers:

a. Grundfos Pumps Corp.

b. Ebara Pump Co.

2. Driver: NEMA MG 1, totally enclosed fan cooled or open-dripproof, squirrel-cage, induction motor complying with NFPA 70. Include wiring compatible with controller used.

3. Jockey Pump Performance Characteristics and Model: Refer to Schedule.

C. Controllers: UL 508; factory-assembled, -wired, and -tested, reduced voltage type for combined automatic and manual operation.

1. Manufacturer to be the same as the Fire Pump Controller Manufacturer.

2. Firetrol Model FTA550F having a short circuit current rating of not less than 30,000 AMPS RMS symmetrical at the operating voltages up to 480 volts.

3. Enclosure: UL 508 and NEMA 250, Type 2 / 12, polycarbonate, wall-mounting type for field electrical wiring.

4. Rate controller for scheduled horsepower and include the following:

   a. Motor circuit protector disconnect switch.

   b. Motor contactor

   c. Hand-off-auto selector switch.

   d. LED indicating lights for: power available, pump running and alarm

   e. Solid state pressure transducer.

   f. Controller shall have a password protected operator interface. It shall provide for set point adjustment, display system pressure and 3 phase motor operating conditions.

   g. Controllers shall record historical operating data and system events.

   h. Running period timer.

5. Controller shall communicate with the fire pump controller. Contractor to provide Ethernet field wired connection between controllers.

D. Accessories and Specialties: Match pressure-maintenance-pump suction and discharge ratings as required for pump capacity rating. Include the following:

1. Circulation relief valve, if required

2. Suction and discharge pressure gages.

E. Pressure-Maintenance-Pump Performance Characteristics and Model: Refer to Schedule

2.6 WARRANTY: The Pump Manufacture shall warranty the system for 12 months from date of start-up not to exceed 18 months from time of shipment.

2.7 SERVICE CONTRACT: The manufacturer's authorized service representative shall provide a one (1) year service contract. The service contract period shall commence after acceptance of the equipment. The service contract shall include a complete system inspection twice a year including: check of proper pump sequencing and alarm activation with adjustments, as required; and review of instructions for operating personnel, if requested. Any required service work to be noted in a formal inspection report along with a detailed proposal for the repairs. The service representative shall provide for 24 hour emergency service.

2.8 ALARM PANELS

A. Description: Factory-assembled and -wired remote panel complying with UL 508 and requirements in NFPA 20. Include audible and visible alarms matching controller type.

1. Manufacturer to be the same as the Fire Pump Controller Manufacturer.

2. Enclosure: NEMA 250, Type 2, remote wall-mounting type.

a. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.

3. Features: Include manufacturer's standard features and the following:

a. Motor-operating condition.

b. Loss-of-line power.

c. Phase reversal.

2.9 FLOWMETER SYSTEMS

A. Description: Fire-pump flowmeter system that indicates flow to not less than 175 percent of fire-pump rated capacity, FM Approved. Include sensor of size to match pipe, tubing, flowmeter, and fittings.

1. Global Vision Inc., GVI-GAF Series or approved equal by one or these Manufacturers:

a. Gerand Engineering Co.

b. Preso Meters Corporation.

2. Pressure Rating: 500 PSIG.

3. Sensor: Venturi, annubar probe, or orifice plate, unless otherwise indicated.

4. Flowmeter: Compatible with flow sensor with dial not less than 4 inches (100 mm) in diameter or manufacturer's equivalent size.

5. Permanently Mounted Flowmeter: Suitable for wall mounting with copper tubing to connect to flow sensor.

6. Portable Flowmeter: With two 12-foot (3.7-m) hoses, in carrying case.

2.10 PRESSURE GAGES

A. Description: UL 393, 3-1/2- to 4-1/2-inch- (90- to 115-mm-) diameter dial with range of 0- to 300-psig (0- to 2070-kPa) minimum. Include caption "WATER" on dial face.

1. Manufacturers:

a. AGF Manufacturing Co.

b. AMETEK, Inc.; U.S. Gauge.

c. Brecco Corporation.

d. Dresser Equipment Group; Instruments Div.

e. Marsh Bellofram.

f. WIKA Instrument Corporation.

2.11 GROUT

A. Description: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

2.12 SOURCE QUALITY CONTROL

A. Test and inspect fire pumps with their controllers according to NFPA 20 for certified shop tests.

B. Verification of Performance: Rate fire pumps according to requirements indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, concrete bases, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of fire pumps.

B. Examine roughing-in for fire-suppression piping to verify actual locations of piping connections before fire-pump installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Install concrete bases of dimensions indicated for fire pumps, pressure-maintenance pumps, and controllers. Refer to Division 21 Section "Common Work Results for Fire Suppression."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.3 INSTALLATION

A. Install and align fire pump, pressure-maintenance pump, and controller according to NFPA 20.

B. Install pumps and controllers to provide access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Set base-mounting-type pumps on concrete bases. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.

1. Support pump baseplate on rectangular metal blocks and shims or on metal wedges having small taper, at points near anchor bolts, to provide 3/4- to 1-1/2-inch (19- to 38-mm) gap between pump base and concrete base for grouting.

2. Adjust metal supports or wedges until pump and driver shafts are level. Verify that coupling faces and pump suction and discharge flanges are level and plumb.

D. Install suction and discharge piping equal to or greater than diameter of fire-pump nozzles.

E. Install valves that are same size as piping connecting fire pumps, bypasses, test headers, and other piping systems.

F. Install pressure gages on fire-pump suction and discharge at pressure-gage tappings.

G. Support pumps and piping separately so weight of piping does not rest on pumps.

H. Install piping accessories, hangers and supports, anchors, valves, meters and gages, and equipment supports.

I. Install flowmeters and sensors where indicated. Install flowmeter-system components and make connections according to manufacturer's written instructions.

J. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

3.4 ALIGNMENT

A. Laser align split-case fire-pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.

B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.

C. Align piping connections.

D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.5 CONNECTIONS

A. Piping installation requirements are specified in Division 21 Section "Water-Based Fire-Suppression Systems." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps and equipment to allow service and maintenance.

C. Connect water supply and discharge piping to fire pumps. Connect water supply and discharge piping to pressure-maintenance pumps.

D. Connect drain lines to point of disposal for:

1. Pump packing glands

2. Relief valve discharge

3. Weekly test solenoid.

4. Each type of drain shall be piped independently from each other.

E. Connect flowmeter-system sensors and meters according to manufacturer's written instructions.

F. Connect controllers to pumps.

G. Connect fire-pump controllers to building fire-alarm system. Refer to Division 28 Section "Fire Detection and Alarm."

H. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

I. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.6 FIELD QUALITY CONTROL

A. Review field-assembled components and equipment installation, including connections.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Final Checks before Startup: Perform the following preventive-maintenance operations and checks:

a. If required by Manufacturer due to storage conditions, remove grease-lubrication-type bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.

b. Disconnect coupling and check electric motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.

c. Verify that pump is free to rotate by hand. If pump is bound or if it drags even slightly, do not operate until cause of trouble is determined and corrected.

3.7 START-UP SERVICE

1. Manufacturer's Field Service: Engage a factory-authorized service representative to review field-assembled components and equipment installation, including connections, and to observe field testing. Report results in writing.

2. Review of field-assembled components and equipment installation

3. Complete start-up checks according to manufacturer's written instructions.

4. Perform starting procedure for pumps is as follows:

   a. Prime pump by opening suction valve and closing drains, and prepare pump for operation.

   b. Open sealing-liquid supply valves if pump is so fitted.

   c. Start motor.

   d. Open discharge valve slowly.

   e. Observe leakage from stuffing boxes and adjust sealing-liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland immediately, but let packing run in before reducing leakage through stuffing boxes.

   f. Check general mechanical operation of pump and motor.

5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

C. Observe field testing.

D. Prepare test and inspection reports.

3.8 Field Acceptance Testing

A. Test each fire pump with its controller as a unit. Comply with requirements for electric-motor-driver fire-pump controllers specified in Division 21 Section "Controllers for Fire-Pump Drivers."

B. Perform field acceptance tests for each fire pump when installation is complete. Comply with operating instructions and procedures in accordance with the Authority Having Jurisdiction and NFPA 20 to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or that does not perform as indicated, then retest to demonstrate compliance. Verify that each fire pump performs as indicated.

1. Furnish fire hoses in number, size, and length required to reach the edge of the roof, storm drain or other acceptable location to dispose of fire-pump test water. Fire hoses are for field-acceptance tests only and are not property of Owner.

C. Submit test results to the Engineer, Owner and Authority Having Jurisdiction.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire pumps, drivers, controllers, and pressure-maintenance pumps.

END OF SECTION 213113

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SECTION 220100
GENERAL PROVISIONS FOR PLUMBING WORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. Except as otherwise specified under "Related Work Not Included", the work of this Contract consists of furnishing all labor, materials, equipment and appliances necessary and required to completely do all Plumbing Work as indicated on the Drawings or described or referred to in the Specifications, including, but not limited to the following:

1. New domestic water back flow preventers and meter assembly.
2. New sanitary, soil, waste and vent piping systems, including all required connections to all plumbing fixtures and equipment, house sewers, and connections to the existing house sewers at the point that leave the building.
3. New domestic cold, hot and hot water circulated water distribution systems including connections to all fixtures and equipment requiring hot and cold water. New hot water heaters, and hot water circulation pumps.
4. New domestic water mixing valve.
5. Plumbing fixtures and trim for same.
6. Excavation and backfill for all work herein specified.
7. Make all plumbing connections required for equipment furnished under other Divisions or Sections of these Specifications.
8. Hose bibbs, wall hydrants, shock absorbers, vacuum breakers and backflow preventers.
9. Sleeves, fire stopping hangers and supports.
10. Insulation for piping and equipment.
11. Apply for, obtain and pay for all permits, certificates, inspections and approvals required in connection with all Plumbing Work.
12. Shop drawings, samples and instructional manuals, tests and adjustments.
13. Installation of all fixtures furnished by Owner and/or furnished under other Divisions or Sections of these Specifications.
14. Duplex domestic booster pump assembly.
15. Sump pump assemblies.

16. All interlocking control wiring and conduit.

17. Color coding and identification of all piping systems in compliance with New Paltz Standards.

18. Cutting and rough patching.

19. Cap flashing and prime painting.

20. Tests for all systems provided under this Section of the Specifications. Submit the results of all pressure tests and disinfection of potable water systems.

21. Where due to Union regulations or trade agreements, if any of the work shown on the Drawings or specified herein is not considered Plumber's Work, this Contractor shall sub-contract the work in question, but this Contractor shall be held responsible for the complete installation.

22. It is not the intention of these Specifications to describe, nor the Contract Drawings to show in detail, all the various pieces of apparatus and appurtenances and their connections. This Contractor shall, as part of the Contract, furnish and install all incidentals, such as piping, fittings, valves, etc., required to complete the installation of the equipment. This Contractor shall refer to Architectural Drawings and Plumbing Drawings for exact location of fixtures including type and quantities. This Contractor shall be responsible for providing and connecting all fixtures and equipment.

23. All work described in these Specifications and not shown on the Drawings, or vice versa, shall be installed in a manner similar to the work shown or described.

1.3 RELATED WORK NOT INCLUDED

A. The following principal items of work shall be provided under other Sections:

1. Finish painting.

2. Furnishing and installation of toilet room accessories.

3. Installation of access doors.

4. Finish painting and patching.

5. All electrical power wiring conduits, etc., for pumps, equipment, etc., shall be provided under Division 26.

6. Drainage piping from HVAC equipment to and spilling over floor drain, mop sink, sump or roof, except as noted.

7. Temporary toilets and water supply.

8. Concrete bases for equipment.

9. Sheet metal gutters and leaders.

1.4 LIST OF SHOP DRAWINGS

A. Submit shop drawings prior to installation covering the following items:

1. Plumbing fixtures, equipment, plumbing fixture trimmings, shut-off valves, balancing valves, faucets, supports, accessories and traps.
2. Valve tags, color coding and valve charts.
3. Vacuum breaker, backflow preventors and shock absorbers.
4. Insulation for piping and equipment.
5. All drains including floor, funnel, shower and area drains.
6. Hose bibbs and wall hydrants.
7. Sleeves, escutcheons, hangers, supports and inserts.
8. Motors, starters and wiring diagrams and equipment.
9. Gauges and thermometers.
10. All types of piping, fittings, valves, etc.
11. Vibration isolators.
12. Domestic booster pump assembly.
13. Sump pump assembly.
14. Domestic hot water heaters and accessories.
15. Domestic hot water circulating pumps.
16. Thermostatic mixing valve.
17. Expansion tanks.
18. Lint interceptor.
19. Backflow preventers.
20. Floor drains.
21. Area drains.
22. As-Built drawings indicating location of all valves with valve tags and all pipe routing per final installation.

B. 1The above listed items are to be considered major equipment and do not limit the Contractor's responsibility from submitting shop drawings for all equipment and accessories which are to be provided under this Section of the Contract.

1.5 VISITING THE PREMISES

A. This Contractor, before submitting his bid on the work, shall visit the site and familiarize himself with all visible existing conditions. As a result of having visited the premises, this Contractor shall be responsible for the installation of the work as it relates to such visible existing conditions.

B. The submission of a bid will be considered an acknowledgment on the part of the bidder of his visitation to the site.

1.6 QUALITY ASSURANCE

A. Manufacturer's Instructions: In addition to the requirements of these Specifications, comply with the manufacturer's instructions and recommendations for all phases of the work.

B. Standards and Codes

2015 International Building Code adopted by New York State
2015 International Plumbing Code adopted by New York State
2015 International Fuel Gas Code adopted by New York State
2015 International Energy Conservation Construction Code adopted by New York State
NFPA
Local Fire Department Requirements
Local Water Company Rules and Regulations
Other State and Local Authorities having Jurisdiction

C. All work and material not specifically described, but required for a complete and proper installation of the work of this Section, shall be provided by the Contractor and shall be new, first quality of their respective kinds, and subject to approval of the Architect.

D. All water supply connections to plumbing fixtures and other equipment to be installed under this Division shall be in accordance with the rules relative to submerged inlets and protective methods to be applied to prevent contamination of water as required by Local and State Regulations.

1.7 ALTERATION WORK

A. All piping to be removed shall be properly plugged or capped so that upon completion of all new work, all abandoned piping shall be concealed in all areas.

B. No dead ends shall be left on any piping upon completion of job.

C. Existing exposed piping not to be reused and not specifically noted or shown on Drawings to be abandoned shall be completely removed.

1.8 CONCRETE WORK

A. All formed and poured-in-place concrete work including equipment housekeeping pads, sumps, etc., will be provided under another Division or Sections of these Specifications.

B. This Contractor shall furnish all required templates for anchor bolts, and dimension drawings for housekeeping pads and sumps. All concrete provided under the work of this

Section shall be in accordance with that specified under another Division or Sections of these Specifications.

C. This Contractor shall coordinate final size of all house keeping pads with final shop drawing approved equipment.

1.9 REPLACEMENT OF SURFACING

A. Where required by operations under this Section, the Contractor shall remove and replace all street pavements, curbs, sidewalks, walkways, grassed areas and landscaped areas which are to remain, in a manner equal to their original condition when new, including sub-bases.

B. In those cases where final surfaces cannot be placed immediately, a temporary surfacing of two inches of bituminous concrete shall be placed and maintained. This shall be removed before placement of final surfacing.

C. Landscaping and grassed areas shall be preserved and/or replaced to the satisfaction of the Architect.

1.10 COOPERATION WITH OTHERS

A. The Plumbing Contractor shall cooperate with other trades whose work is to be correlated with his work in order to avoid field interference, improper elevations, or inaccessibility to equipment. Any extra expense occasioned by lack of cooperation by this Contractor shall be borne by him.

1.11 PIPING AND EQUIPMENT IDENTIFICATION

A. Piping and equipment identification shall include:

1. Nameplates

2. Tags

3. Pipe Markers

B. Reference Standards

1. ASME A 13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

C. Submittals

1. See Section 031000 - Administrative Requirements, for submittal procedures.

2. List: Submit list of wording, symbols, letter size, and color coding for plumbing identification.

3. Chart and Schedule: Submit valve chart and schedule, include valve tag number, location, function, and valve manufacturer's name and model number.

D. Manufacturers

1. Brady Corporation: www.bradycorp.com

2. Seton Identification Products: www.seton.com/aec.

E. Nameplates

1. Description: Laminated three-layer plastic with engraved letters.

a. Letter Color: White
b. Letter Height: ¼ inch
c. Background Color: Black

F. Tags (furnish and attach to each valve)

1. Metal Tags: Brass with ½" indented numbers filled with black compound; tag size minimum 1½ inch diameter with smooth edges. Tags shall be securely attached to stems with brass "5" hooks.

2. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

G. Pipe Markers

1. Color: Conform to ASME A 13.1.

2. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

3. Sanitary, vent, cold water, hot water, hot water return, gas and pump discharge.

H. Degrease and clean surfaces to receive adhesive for identification materials.

I. Installation

1. Install plastic pipe markers in accordance with manufacturer's instructions.

2. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

3. Identify pumps, hot water heaters, and tanks, with plastics nameplates. Small devices, such as in-line pumps, may be identified with tags.

4. Identify control panels and major control components outside panels with plastic nameplates.

5. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping ¾ inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

6. Locate ceiling tacks to locate valves above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 220100

SECTION 220523
VALVES FOR PLUMBING WORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The Work of this Contract includes providing all labor, materials, accessories, services and tests necessary to install complete and make ready for operation by the Owner, all work as shown on Drawings and as specified hereinafter.

1.3 SPECIAL REQUIREMENTS

A. Furnish all valves as indicated on the plans, or as may be required for the proper control of the pipe lines installed under these Specifications, so that any fixture, line or piece of apparatus may be cut out for repair without interference or interruption of the service to the rest of the building. All water valves shall have a minimum working pressure of 250 psi, and shall be water rated unless otherwise noted on the Drawings or specified herein. All valves shall be of one manufacturer. Bronze material used in valve construction shall conform to ASTM B61 or B62 and meet the requirements of NSF 61.

B. All gate valves within the building shall be wedge gate valves with painted iron wheel handles. They shall have gland followers in stuffing boxes, and shall be constructed so that they may be repacked while open and under pressure. All valves shall have the name of the manufacturer and working pressure cast or stamped on them.

C. All ball valves 3" and smaller shall be all bronze with soldered or screwed joint ends as required by the piping system in which they are installed.

D. All gate valves 4" and larger shall have iron bodies with bronze mounting except where otherwise required by the authorities having jurisdiction and shall be provided with screwed or flanged ends as required by the piping system in which they are installed. All gate valves controlling equipment shall be of the OS&Y rising stem type except where space conditions do not permit the installation of this type of valve. In such cases non-rising stem valves shall be provided.

E. Globe valves shall be of all bronze with composition disc, threaded or soldered joint ends as required by piping system in which they are installed.

F. Ball valves shall be two-piece bronze ball valves with soldered ends.

G. Check valves up to and including 3" shall be all bronze swing check type with threaded or soldered joint ends. Check valves 4" and larger shall have bronze mounted iron bodies and shall be provided with screwed or flanged joint ends as required by piping system in which they are installed.

H. Drain valves shall be ¾" hose bibb with vacuum breaker similar or equal to Watts LFSC with cast iron handwheel and with Watts LFS VB

I. At the high point of the hot water piping system provide a ½" manual IBBM air relief valve, 125 PSI, WOG Class.

J. All valves shall have the trademark of the manufacturer and the guaranteed working pressure cast or stamped on the body of the valve. All gates or globes, etc., shall be of one manufacturer.

K. All valves to be lead free and NSF 61 compliant.

L. Gate valves shall be used for pumps, equipment, and incoming water service.

M. Angle valves shall be used for all fixture connections.

N. Check valves shall be used as indicated on drawings.

O. Ball valves shall be used for isolation valves, taps for branch piping / branch take offs, and small equipment 3" connection or smaller.

P. Balancing valves shall be used as indicated on drawings.

Q. Master mixing valve shall be after the hot water heater before hot water distribution throughout the building as indicated on drawings.

R. RPZ valve shall be for the mechanical make up water as indicated on drawings.

S. DCVA valve shall be for the water service as indicated on drawings.

T. Plug valve shall be for the gas shut off valves as indicated on drawings.

PART 2 PRODUCTS

2.1 INTERIOR PIPING SYSTEM VALVES

A. Domestic water valves tabulated herein have been selected from the catalog of the Milwaukee Valve Co. Approved equals of NIBCO Co., Stockham, Crane Co. and Walworth Co. will be reviewed.

Gate Valves	4" & larger	flanged rising stem	F2885SM
	3" & smaller	threaded non-rising	105
	4" & larger	flanged non-rising	F2882M
Angle Valves	3" & smaller	threaded	595
Check Valves	3" & smaller	threaded	509
		brazed ends	1509
	4" & larger	flanged	F2974M
Ball Valves	3" & smaller	threaded	BA100
	3" & smaller	solder end	BA150

Balancing Valves — Furnish and install balancing valves as manufactured by Bell & Gossett. "Circuit Setter Plus" Series, CB a calibrated unit consisting of a bronze body, brass ball, glass and carbon filled TFE seat rings, brass readout valves with EPT check valves, EDPM Stem "O" Ring and sweat solder ends working pressure at 200 PSIG LEAD FREE. Valves shall be complete with read out ports. Provide suitable read out kits for GPM flow, for each size, type. Valve to be lead free and NSF 61 compliant. Similar and equal to Bell & Gossett Series CB-3/4 LF.

B. Ball valves as listed herein may be used for domestic water piping as an alternate for gate valves 3" and smaller. If used, provided extended stems.

C. Gate valves 3" & smaller.

Bronze body with solder ends and all bronze stem and wedge, non-asbestos packing, malleable iron handwheel with brass wheel nut, 125 lbs. WSP, 200 lbs. WOG. Specification conforms to MSS SP-80 type 1 Class 125, ASTM B162 and CA 360.

D. Gate Valves 4" & Larger

Iron body bronze mounted flanged ends, non-rising stem with bronze wedge face ring, bronze seat ring, bronze wedge bushing, brass stem, bronze gland follower nut, bronze stuffing nut, cast iron wedge steel body nut, cast iron bonnet, steel body nut, graphite non-asbestos packing, graphite non-asbestos gaskets. 125 lbs. WSP, 200 lbs. WOG. Specification conforms to ASTM-A126 Class B, ASTM-B16 and ASTM-B62.

E. Ball Valves

2 piece unit with bronze body, full port soldered ends 316 stainless steel ball and stem, glass filled teflon seals seats and washers, zinc plated steel handle with vinyl hand grip 150 lbs. WSP-600 lbs. WOG. Specifications conform to ASTM-B584, ASTM-B16, ASTM-B276 and ASTM-B633.

F. Master Mixing Valve Station

1. Two-Valve Hi/Lo Thermostatic Valves High capacity water temperature control system will be pre-assembled and pre-tested and mounted on heavy duty metal struts for stability. The system includes two thermostatic valves capable of maintaining water temperature within the performance requirements of ASSE 1017 and CSA B125.

2. This produect is certified to meet low lead requirements of wetted surface area containing less than 0.25% lead by weight.

3. Large thermostatic water mixing valve, adjustable high temperature limit stop, inlet check stops, wall support, outlet ball valve.

4. Small thermostatic water mixing valve, adjustable high temperature limit stop, intergral check stops, outlet ball valve.

5. Valve system 2" inlets, and 2" outlets, 1 gpm minimum flow capacity, color coded dial thermometer, inlet manifold piping, locking temperature regulator, factory assembled and tested. Valve to be shipped with inlet thermometers and test connections.

6. Manufacture and model as listed on drawings or equal.

2.2 REDUCED PRESSURE ZONE VALVE (RPZ)

A. New reduced pressure zone valve type backflow preventer on domestic water supply service to building as indicated on the drawings. NYS and DEP approved.

B. The Reduced Pressure Principle Backflow Preventer shall be certified to NSF/ANSI 61, ASSE® Listed 1013, rated to 180°F, and supplied with full port ball valves. The main body shall be Nylon and the seat disc elastomers shall be silicone. If installed indoors, the installation shall be supplied with an air gap adapter.

C. For model number refer to plumbing drawings.

2.3 DOUBLE CHECK VALVE ASSEMBLY (DCVA)

A. New double check valve type backflow preventer on domestic water supply service to building as indicated on the drawings. NYS and DEP approved.

B. Double check valve backflow preventer (DCVA) shall be certified to NSF/ANSI 61, ASSE® Listed 1015, and supplied with full port gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTM A 536), the seat ring and check valve shall be NORYL™, the stem shall be stainless steel (ASTM A 276) and the seat disc elastomers shall be EPDM. The checks shall be accessible for maintenance without removing the device from the line.

C. For model number refer to plumbing drawings.

2.4 PLUG VALVES

A. Type AA: 200 psig WOG, lubricated type with standard port opening, cast iron or semi-steel body, sealed lubrication system with lubricant fitting and dial indicator, cylindrical plug or teflon tapered plug, lubricant grooves in body or plug, threaded or flanged ends depending on size, and capable of lubrication with valve under pressure and plug in any position.

1. Acceptable Valves:

a. 1/2 inch to 3 inch size: Homestead 611 & 612, , Resun R1430 & R1431, Nordstrom Valves, Inc. Fig. 142 and Rockwell 142 & 143.
b. 4 inch size: Homestead 611 & 612, , Resun R1430 & R1431, Nordstrom Valves, Inc. Fig. 115 and Rockwell 142 & 143.

A. Type AB: 100 psig WOG, gas cock type with cast iron or bronze body, bronze plug, square head, wrench operator, and threaded ends. Acceptable Manufacturers:

1. Crane.
2. Eclipse Combustion.
3. A. Y. McDonald.
4. Nordstrom Valves, Inc.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. The entire plumbing systems shall be supplied with valves so located, arranged and operated as to give a complete regulating control to all fixtures and apparatus.

B. Shut-off valves shall be provided on all risers, branch lines and at each piece of equipment.

C. Install balance valve downstream side of the shut-off valve on hot water circulating riser and branch lines. See detail on design documents.

D. Valves, where exposed and used in connection with finished piping, shall have the same finish as the pipe.

E. Provide drain valves at the heel of each plumbing water riser and at low points of the horizontal mains.

F. Provide shut-off valves and check valves on each pump discharge line.

G. All valves used on branch piping to bathroom and kitchens shall be all bronze type full port ball valves suitable for service to which they are connected.

H. Install valves where required for proper operation of piping and equipment, including valves in branch lines necessary to isolate sections of piping. Locate valves so as to be accessible.

I. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

J. Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.

K. Install valves with bodies of metal other than cast iron where thermal or mechanical shock is indicated or can be expected to occur.

L. Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected to occur.

M. Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.

N. Except as otherwise indicated, install gate, ball, globe, and butterfly valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valves.

O. Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shut-off of metal seated valves.

P. Master mixing valve and all other valves to be installed and comply with manufacture requirements.

Q. Select and install valves with replaceable seats, except where otherwise indicated.

R. Installation of Check Valves

1. Swing Check Valves: Install in horizontal position with hinge pin located on the upside of the pipe and perpendicular to the pipe's centerline.

2. Wafer Check Valves: Install between 2 flanges in horizontal or vertical position.

3. Horizontal Lift Check Valve: Install in horizontal pipe section with stem vertically upward.

4. Vertical Lift Check Valve: Install in vertical pipe section with upward flow.

5. Spring Loaded Horizontal Lift Check Valve: Install in horizontal pipe line with stem vertically upward.

END OF SECTION 220523

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING WORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 – General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The work of this Contract includes providing all labor, materials, accessories, services and tests necessary to install complete and make ready for operation by the Owner, all Hangers and Supports for Plumbing Systems as shown on the Drawings and as specified hereinafter.

1.3 SPECIFIC REQUIREMENTS

A. Provide products which are Underwriters Laboratories listed and Factory Mutual approved.

B. Provide pipe hangers and supports of which materials, design, and manufacture comply with ANSI/MSS SP-58.

C. Select and apply pipe hangers and supports, complying with MSS SP-69.

D. Fabricate and install pipe hangers and supports complying with MSS SP-89.

E. Assume the responsibility for the proper transfer of the loads of the piping system to the structure. No additional cost to the Owner should be expected for any corrective work during construction.

F. Supports and hangers shall be provided for all horizontal and vertical piping. The hanger design shall conform to the ASA Code for Pressure Piping. Hangers shall be kept outside of pipe insulation.

G. All bracket clamps and rod sizes indicated in these Specifications are minimum size only. This Contractor shall be responsible for structural integrity of all supports. All structural hanging material shall have a safety factor of five (5) built in.

H. All horizontal cast iron pipe shall be supported every five (5) feet and at each hub and/or "no-hub" clamping assembly. When a concentration of fittings occurs, additional support shall be installed consistent with good trade practices. "No-hub" system must be supported in accordance with Standard CISPI-310-78 in compliance with 2015 international Plumbing Code adopted by NYS Table 308.5.

I. All vertical cast iron pipe shall be supported every floor with maximum spacing of 15 feet and at each hub and/or “no-hub” clamping assembly in compliance with 2015 international Plumbing Code adopted by NYS Table 308.5.

J. Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees for pipe sizes 4 inches and larger in compliance with 2015 international Plumbing Code adopted by NYS 308.6.

PART 2 PRODUCTS

2.1 HANGERS AND SUPPORTS
(Coordinated with building construction)

A. Pipe supports shall be of the following type and figure number, manufactured by C&P, F&M, Grinnell, or equal as approved:

B. Pipe Hanger Schedule

	C&P	F&M	Grinnel
Clevis Hanger	100	239	260
180 Degree Shield	265P	80	-
Pipe Saddle	351	170 & 180 Series	1700 Series
Rigid Trapeze	371	Std. 45	
U-Bolt	283	176	137
Riser Clamp	89 or 126	241	261
Double Bolt Pipe Clamp	304	261	295
Continuous Slotted Insert	1480	190	-

C. Insulation Protection

1. For all insulated pipe furnish clevis hangers with welded shields and equal to C&P, Inc., Fig. 100-SH.

D. Pipe Supports in Pipe Chases

1. Supports shall securely hold piping, prevent vibration, etc. Provide pipe supports and channels as required. Use Grade KJA Cycolac DH self-extinguishing ABS as manufactured by the Sumner Corporation or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Provide necessary structural members, hangers and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations. In all cases where hangers, brackets, etc., are supported from concrete construction, care shall be taken not to weaken concrete or penetrate waterproofing. All hangers and supports shall be capable of screw adjustment after piping is erected. Hangers supporting piping

expanding into loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction. Hangers in contact with copper or brass pipe shall be copper plated steel.

B. Pipe hangers shall be of the clevis and pipe roller types, except where otherwise noted.

C. Where piping is run near the floor and not hung from the ceiling construction but is supported from the floor, such supports shall be of pipe standards with base flange and adjustable top yoke similar to C&P Fig. 101 or equal.

D. Except where otherwise noted, piping shall be supported from structural steel only. Provide supplementary steel where required.

E. Piping shall not be hung from other piping, ducts, conduits or from equipment of other trades.

F. All water piping connected to rotating equipment within all mechanical spaces shall be isolated from the building structure by means of vibration hangers inserted in the hanger rods. The vibration hangers shall consist of a steel spring in combination with a double deflection neoprene element within a rectangular steel housing. Combined static deflection shall be 1.375" minimum. Hangers shall have capability of supporting the piping at a fixed elevation during installation and shall incorporate an adjusting device to transfer the load to the spring. Deflection shall be indicated by means of scale. Vibration hangers shall be Fig. No. 360 or type PCDNHS as made by Mason Industries, as specified under another Section of these Specifications.

G. Where additional steel is required for the support of hangers, furnish and install same subject to the approval of the Architect. Piping shall not be supported from the metal deck slab construction.

H. All piping running on walls shall be supported by means of hanger suspended from heavy angle iron wall brackets. No wall hooks will be permitted.

I. Lateral bracing of horizontal pipe shall be provided where required to prevent side sway or vibration. The lateral bracing shall be of a type approved by the Architect and shall be installed where directed by the Architect.

J. All anchors shall be separate and independent of all hangers, guides and supports. Anchors shall be of heavy blacksmith construction suitable in every way for the work approved by the Architect. Anchors shall be welded to the pipe and fastened to the structure with anchor type bolts.

K. Anchors shall be fabricated and assembled in such a form as to secure the piping in a fixed position. They shall permit the line to take up its expansion and contraction freely in opposite directions away from the anchored points; and shall be so arranged as to be structurally suitable for particular location and line loading. Submit details for approval.

L. All horizontal steel and copper pipe shall be supported at maximum intervals as follows: Steel pipe - up to 1¼" - 8'-0"; 1½" to 2½" - 10'-0"; 3" and larger - 12'-0". Copper tube and Brass Pipe - up to 1¼" - 6'-0"; 1½" to 2½" - 8'-0"; 3" and larger - 10'-0". There shall be no metal-to-metal contact at supports for non-ferrous pipes. Provide 1/8" thick neoprene strips

or Summer Inc. pipe clamps under uninsulated piping at supports. Hangers and supports shall be installed outside of insulation or insulated piping.

M. Trapeze type hangers shall be made up of angles bolted back-to-back or channels for supporting parallel lines of piping. Trapeze type hangers shall be supported with suspension rods having double nuts, and securely attached to construction with inserts, beam clamps, steel fishplates, cantilever brackets, lag screws or other approved means. Use approved type brackets for supporting piping attached along walls. Non-insulated piping (compressed air, gas, etc.) supported by trapeze hangers shall be provided with hold down clamps at the trapeze hangers. If only non-ferrous piping (copper, etc.) is supported on the trapeze hangers, the trapeze and hold down clamps shall be copper clad.

N. Maximum weights on hanger rods shall be such that stress in tension shall not exceed 9,000 psi, using root area of threaded portion. In no case shall hanger sizes be less than 3/8" for pipe up to 2", ½" for pipe 1½" to 3½", 5/8" for pipe 4" to 5", ¾" for pipe 6", 7/8" for pipe 8" to 12".

O. Supports for vertical piping shall be double bolt riser clamps, with each end having equal bearing on the building structure located at alternate floors. Cast iron soil pipe shall be supported at every floor and at its base.

P. All auxiliary steel for pipe supports shall be furnished and installed under this Section.

Q. All hangers, rods, inserts, clamps, stanchions, brackets, etc., shall be dipped in zinc chromate primer before installation and provided with one (1) coat of approved type paint after installation.

R. Chains, straps, perforated iron or wire hangers are not permitted.

S. The Architect must approve method of supporting pipes from building structure before work is started. The Contractor shall bear all responsibility for materials and workmanship as described in this Section, and shall make sure that all hangers and supports are properly and permanently connected to building structure. No piping shall be hung from metal deck; auxiliary steel shall be provided.

T. All pipe support shall be installed to avoid interference with other piping, hangers, electrical conduits and supports, building structures and equipment.

U. Rigid support bracing shall be provided at changes in direction greater than 45 degrees for pipe sizes 4 inches and larger.

END OF SECTION 220529

SECTION 220700
INSULATION FOR PLUMBING WORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The Work of this Contract includes providing all labor, materials, accessories, services and tests necessary to install complete and make ready for operation by the Owner, all work as shown on Drawings and as specified hereinafter.

B. The piping systems and equipment to be insulated shall include, but not be limited to the following:

1. Domestic hot, hot water return, and cold water piping.

PART 2 PRODUCTS

2.1 INSULATING MATERIALS

A. All insulation shall have a composite (insulation, jacket facing and adhesive used to adhere jacket or facing to the insulation) fire and smoke hazard ratings as tested by Procedure ASTM E-84, NFPA 255 and UL 73, not exceeding flame spread of 25, fuel contributed of 50, and smoke developed of 50. Accessories such as adhesives, mastics, cements, tapes and cloths for fittings shall have component ratings as listed above. Insulation shall be glass fiber with a maximum K factor 0.23 at 75°F. mean temperature. Density shall not be not less than 3 lbs. per cu. ft.

B. The materials as specified below have been selected from the catalog of Owens-Corning Fiberglass Corp. and are representative of the quality, design and finish desired. Insulation as manufactured by other manufacturers may be submitted for approval, provided the products meet fully in all respects (such as density, moisture absorption, alkalinity, thermal-conductivity, jacket, etc.) the materials as designated below.

1. Fiberglass Pipe Insulation: FS HH-I-558B, Form D, Type III, Class as indicated.

   a. Provide Class 12 for hot, hot water return, and cold plumbing piping.

2. Fiberglass Pipe Fitting Insulation: FS HH-I-558, Form E, Class as indicated.

   a. Provide Class 16 for use with Class 12 pipe insulation, where temperature does not exceed 450°F.1

3. Vapor Barrier Materials: FS HH-B-100, Type I, paper-backed aluminum foil, except as otherwise indicated, strength and permeability rating equivalent to adjoining pipe insulation jacketing.

4. Adhesives and Protection Finish shall be Benjamin Foster 30-36.

5. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth or canvas material, not less than 7.8 ounces per square yard.

6. Fitting and Valves: Zeston 25/50 rated -20 mil PVC covers over fiberglass insulation and PVC Z Tape.

2.2 RELATED MATERIALS AND REQUIREMENTS

A. At pipe supports Insul-Shield pipe saddles and matching hanger shall be used. Joints of insulation abutting Insul-Shielding pipe saddles shall be butted with IC-405, and the joints firmly pressed together.

B. All concealed and exposed piping shall be provided with factory ASJ (Owens/Corning Fiberglass) secured in place with vapor barrier adhesive IC-225. To be provided with integral adhesive pressure sensitive battery strip seals to complete the positive closure system.

2.3 INSULATION REQUIREMENTS

A. Insulation to comply with 2015 International Energy Conservation Code as adopted by New York State and Table 403.2.10.

B. Cold Water Piping

1. Cold Water - 1¼" and smaller - ½" insulation, All service jacket.

2. Cold Water - 1½" and larger - 1" insulation, All service jacket.

3. Frostproofed Piping - 3" insulation, dual temperature fire retardant jacket.

C. Hot Water and Hot Water Return Piping

1. Hot Water Supply and Return – 1¼" and smaller - 1" insulation, All service jacket.

2. Hot Water Supply and Return - 1½" and larger - 1½" insulation, All service jacket.

D. Miscellaneous Equipment

1. Insulate water meter with 4 pound density 1" thick vapor barrier glass insulation blanket, fitted and contoured to shape and secured in place with bends or wire. Apply two coats of mineral wool, cement and trowel to a smooth finish, and finish with two applications of Benjamin Foster 30-36 vapor barrier finish.

E. Tailpipes, traps, drain pipes and water supplies for ADA lavatories and sinks shall be covered with Plumberx Pro Extreme Model No. X4333.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage. Staples shall not be used on vapor barrier.

B. Cover valves, flanges, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory, precut or job fabricated units (at Installer's option) except where a specific form or type is indicated.

C. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

D. Install protective metal shields and insulated inserts at each hanger and support to prevent compression of insulation.

E. Do not apply insulation to hot equipment.

F. Apply insulation using the staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.

G. Coat insulated surfaces of equipment with layer of insulating cement, troweled in a workmanlike manner, leaving a smooth continuous surface. Fill in scored block, seams, chopped edges and depressions, and cover wire netting and joints with cement of sufficient thickness to remove surface irregularities.

H. Cover insulated equipment surface with jacketing neatly fitted and firmly secured. Lap seams at least two inches. Apply over vapor barrier where applicable.

I. Direct contact between pipe and hanger shall be avoided. Hanger shall pass outside of metal saddle which cover a section of high density insulation (such as calcium silicate) of sufficient length to support pipe without crushing insulation. Hangers or saddles shall not pierce insulation and vapor barriers.

3.2 1INSTALLATION REQUIREMENTS

A. Install insulation products in accordance with the manufacturer's written instructions, and in accordance with recognized industry practices to ensure that the insulation serves its intended purpose.

B. Install insulation on pipe systems subsequent to testing and acceptance of tests.

C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete the run. Do not use cut pieces of scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure a complete and tight fit over surfaces to be covered.

E. The Contractor shall take every precaution necessary to ensure that the covering material is in satisfactory condition to receive painting.

F. Penetration of walls and floors by piping connection to rotating equipment shall be provided with a fiberglass sleeve, the full depth of pipe penetration.

G. Do not insulate hand holes, cleanouts, ASME stamp, or the manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.

H. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

I. The installer of the piping insulation shall advise this Contractor of required protection for the insulation work during the remainder of the construction period, to avoid damage and deterioration.

END OF SECTION 220700

SECTION 220800
COMMISSIONING OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Abbreviations: The following are common abbreviations used in the Specifications.

A/E -	Architects and Design Engineers	EC -	Electrical Representative
CxA -	Commissioning Authority	FT -	Functional Performance Test
CC -	Controls Representative	CM-	Construction Manager
CTR -	Contractors	MC -	Mechanical Representative
Cx -	Commissioning	PFI -	Pre-Functional Inspection
Cx Plan -	Commissioning Plan Document	PM -	Project Manager (of the owner)
PC -	Plumbing Representative	TAB -	Test and Balance Contractor

1.2 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. The Owner and the CxA reserves the right to amend this list at anytime during the construction and acceptance process.

Plumbing

1. Gas Fired Domestic Hot Water Heaters
2. Domestic Hot Water Circulation Pumps
3. Domestic Water Booster Pump
4. Domestic Water Fixtures and Mixing Valves
5. Instantaneous Domestic Hot Water Heater
6. Sump Pump

1.3 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. General specifications for commissioning responsibilities and reporting requirements are provided in the following sections:

Section 019113 – General Commissioning Requirements
Section 240100 – Commissioning Requirements

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FUNCTIONAL TESTING SUPPORT REQUIREMENTS

A. General Requirements
   1. This section provides brief descriptions of the testing and support the contractor(s) will be required to provide to perform the functional testing of the plumbing equipment for the project.
      The Cx Authority will further define the tests and procedures in the Testing and Acceptance Modules as well as the individuals required to support the testing.

B. Gas Fired Domestic Hot Water Heaters and Circulation Pumps
   1. The contractor(s) will be required to demonstrate all safeties (personnel and mechanical e.g. loss of flow, high temperature, low gas pressure, etc.); local device operation; any local controls including temperature control.
   2. The contractor(s) will be required to monitor and demonstrate the operation of the circulation pumps over a pre-determined time cycle to ensure proper function of the unit (e.g. flow, local controls).
   3. The contractor will be required to demonstrate all local controls and required alarms.
   4. The BMS contractor will be required to demonstrate any monitored points and alarms.

C. Domestic Water Booster Pumps
   1. The contractor will be required to support the commissioning of 100% of the domestic water booster pumps.
   2. The contractor (s) and the manufacturer's representative will be required to demonstrate that all pumps are properly aligned, the pumps operate in the proper direction and that the overload protective devices are installed properly and set to the proper settings.
   3. The contractor (s) will be required to demonstrate in writing (TAB Report) that the pumps are balanced to achieve the specified design flows, including motor performance data as specified in the TAB specifications.
   4. The following operational sequences, equipment, devices, and systems will also be demonstrated for proper operation to the CxA:
      a. Start/stop.
      b. Speed control.
      c. Lead/lag sequence.

D. Domestic Water Piping, Mixing Valves and Accessories
   1. The contractor(s) will be required to demonstrate in writing that all domestic water piping has been cleaned and sanitized before the system has been primed.
   2. The contractor(s) will be required to demonstrate in writing (TAB Report) that all domestic water system has been balanced to achieve the specified design flows, as specified in the TAB specifications.

E. Instantaneous Domestic Hot Water Heaters
   1. The contractor(s) will be required to demonstrate all safeties (personnel and mechanical e.g. loss of flow, high temperature, etc.); local device operation; any local controls including temperature control.

2. Any local control panel controls will require the representative who was responsible for the programming and setting up of the equipment to document the set points and demonstrate the performance of their equipment.

F. Sump Pump
1. The contractor will be required to support the commissioning of 100% of the sump pumps.
2. The contractor(s) and the manufacturer's representative will be required to demonstrate that all pumps are properly aligned, the pumps operate in the proper direction and that the overload protective devices are installed properly and set to the proper settings.
3. The following operational sequences, equipment, devices, and systems will also be demonstrated for proper operation to the CxA:
   a. Start/stop.

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SECTION 221116
PIPE, TUBE AND FITTINGS FOR PLUMBING WORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The work of this Contract includes the providing of all labor, materials, accessories, services and tests necessary to install, complete and make ready for operation by the Owner, all work as shown on the Drawings and as specified herein.

1.3 SPECIFIC REQUIREMENTS

A. Pipe and fittings shall conform to the latest USASI, ASTM, ANSI and/or F.S. Standards, and/or Cast Iron Soil Pipe Institute Standards No. 301 and 310.

B. All pipes, fittings, traps, materials and/or other devices used in the plumbing system shall have cast, stamped, or indelibly marked on it the maker's name or mark, weight, and quality of the product when such marking is required by the approved standard.

C. All pipes and fittings used on the domestic water system shall be lead free and comply with NSF 61.

PART 2 PRODUCTS

2.1 PIPING MATERIAL

A. Underground interior soil, waste, vent and storm piping shall be service weight cast iron soil pipe, and bell and spigot fittings, with grooved hub and male spigot compression type joints using a neoprene gasket and lubricant similar to Ty-Seal gaskets or approved equal. Pipe and fittings shall conform to the latest ASTM A-74 and C-564 Standards.

B. Interior above ground storm, soil waste and vent piping shall be service weight cast iron soil pipe with no-hub couplings joints.

C. All storm, soil waste and vent piping connections shall be 45 deg fittings where possible. Only when 45 deg fittings are not possible and 90 deg fittings are required sanitary tee shall be provided.

D. Interior above ground pump discharge piping shall be galvanized steel pipe schedule 40, roll grooved ends, grooved pipe fittings in size 2” and above.

E. Interior above-ground domestic water piping shall be seamless drawn or extruded hard temper Type "L" copper tubing, ASTM B-88, with solder joint fittings. Fittings shall be copper. Joints shall be made with a lead-free solder alloy (95/5) consisting of tin-antimony water

soluble flux (Qualitek 775) and shall conform to ASTM Specification B-32, minimum 250 psi WWP. All underground domestic water pipe and fittings shall be asphaltum coated.

F. Interior above-ground gas piping and fittings shall be in accordance with 2015 international Fuel Gas Code adopted by NYS: Pipe shall be schedule 40 black steel piping and seamless as per ASTM A53. Fittings shall be threaded 150 lb., Class 150 black malleable iron as per ASTM A197, latest edition. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

G. Exterior above-ground gas piping and fittings shall be in accordance with 2015 international Fuel Gas Code adopted by NYS: Pipe shall be schedule 40 galvanized steel piping and seamless as per ASTM A53. Fittings shall be threaded 150 lb., Class 150 galvanized malleable iron as per ASTM A197, latest edition. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment. Piping shall be installed not less than 3-1/2 inches above grade per NYS FGC 404.9.

H. Exterior below-ground gas piping and fittings shall be in accordance with 2015 international Fuel Gas Code adopted by NYS: Pipe shall be high density polyethylene yellow/ black with yellow stripe gas piping and seamless as per ASTM D2513 and ASTM D1505 with a SDR of 11 . An insulating coupling or fitting shall be used to transition to metal and metal shall be corrosion protected (similar to Mill-Wrap) used before penetrating above ground. Pipe shall have a minimum burial depth of 12 inches per NYS FGC 404.12.1. Trace wire shall be provided per NYS FGC 404.17.3 trace wire shall not be less than 18 AWG and the insulation type shall be suitable for direct burial.

2.2 STERILIZATION

A. The entire domestic water piping system shall be thoroughly sterilized with chlorine before acceptance for domestic operation.

B. The amount of chlorine applied shall be such as to provide a dosage of not less than 50 parts per million. The chlorinating material shall be either liquid chlorine or sodium hypochlorite solution and shall be introduced into the system and drawn to all points of the system. All lines shall be thoroughly flushed before introduction of the chlorinating material. After a contact period of not less than twenty four (24) hours, the system shall be flushed with clean water until the residual content is not greater than 0.2 parts per million. All valves in the lines being sterilized shall be opened and closed several times during the contact period.

C. Sterilization and tests for purity of water in the entire piping system shall be performed by the Contractor through an approved independent testing laboratory and a certificate shall be furnished to the Architect certifying the quality of purity.

PART 3 EXECUTION

3.1 INSTALLATION NOTES FOR UNDERGROUND PIPING SYSTEMS

A. All piping and fittings shall be installed straight, and all joints shall be kept free from dirt and grit.

B. After trench has been excavated in accordance with these Specifications, pipes may be rolled to the trench, but shall be carefully lowered by suitable rigging and put in place as provided herein. Pipe shall not be rolled into trench.

C. All straight pipe and special castings shall be cleaned by brushing and by washing out all foreign matter prior to laying. If the Architect so directs, a proper mandrel shall be provided by the Contractor which shall be drawn forward as each pipe or special casting is laid. All branches and other openings shall be stopped up by wooden plugs or heads until either connected or capped. Pipe and special casting shall be laid to required line or grade. Where necessary, temporary wood blocking shall be used; such blocking to be removed as backfilling progresses. Whenever it is necessary to connect with or relay existing water mains, such connections or alterations shall be made by the Contractor as specified herein.

D. The Contractor shall plug or cap any remaining open ends which result from the removal of existing pipe which is to be abandoned. The open ends shall be plugged or capped with cast iron plugs or caps. Live ends of pipe shall be plugged or capped and backed with concrete to provide sufficient bearing equal to the pressure in the pipe times the area of the pipe as directed by the Architect.

E. Piping shall be properly aligned, graded and supported. Piping shall be of correct lengths to permit the joints to be made up without springing or forcing. Change in direction shall be made by use of fittings. Piping shall not be deflected from a straight line at joints in either horizontal or vertical plane, except as authorized by the Architect, and not to exceed the recommendations of the manufacturer.

F. During construction temporary plugs or caps shall be installed in completed portions of the piping. All portions of the Contractor's work shall be carried out so as to prevent the entrance of dirt or other foreign matter into the system.

G. The Contractor shall make all crossing as required by conditions encountered during construction and at no additional expense to the Owner.

H. The Contractor shall be responsible for all damage and repairs to utilities. Any additional costs are at his own expense and repairs shall be completed to the satisfaction of the Architect.

I. Provide vertical and horizontal separation between new water mains in accordance with Codes and Standards requirements.

J. Backing shall be of concrete and shall be placed between solid ground and the fitting to be anchored. Backing shall be placed so that the pipe and fitting joints will be accessible for repair, unless otherwise directed by the Architect. Provide tie rods set into concrete.

K. After the piping has been installed, tested and approved, the trenches shall be backfilled with the excavated materials, free from large clots, stones, frozen or deleterious materials in the following manner: From the bottom of the pipe to the centerline of the pipe, the trenches shall be backfilled by hand with approved material placed in layers of 3 inches and each layer compacted by hand tamping. Backfilling materials shall be deposited in the trench for its full width on each side of the pipe.

L. From the centerline of the pipe to a depth of one foot above the top of the pipe, the trenches shall be backfilled by hand with approved materials placed in 3 inch layers and hand tamped to compaction.

M. The installation of underground gas piping shall comply with the 2015 international fuel gas code as adopted by New York State. Piping shall be protection against corrosion and be installed a minimum depth of 12 inches below grade.

3.2 INSTALLATION NOTES FOR ABOVE GROUND PIPING SYSTEMS

A. It is the intent that each part of the plumbing systems shall be complete in all details and all lines provided with all control valves as indicated on Drawings, or as may be required for the proper control of the pipe lines under this Section so that any fixture, line or piece of apparatus may be cut out for repair without interference or interruption of the service to the rest of the building.

B. The size of storm, soil, waste, water, and vent piping shall be as determined by the local rules and regulations for plumbing and drainage, except where specifically noted to be larger by the Specifications or plans; and all fixed rules of installation as set forth in the Rules and Regulations shall be followed as part of the Specifications.

C. The Contractor shall examine carefully the architectural plans and details and familiarize himself with all conditions relative to the installation of piping, particularly where same is concealed behind furring or in hung ceilings.

D. In no case shall the Contractor permit his pipes to be exposed beyond finished plaster lines unless specifically shown on Drawings. He shall consult with the other trades in the building and install his piping in such a way as to least interfere with the installation of other trades.

E. Water piping shall be installed to drain, and branches shall not be trapped, but shall have continuous pitch. Where necessary to raise or lower mains, the same shall be provided with a drip and shall be properly valved and capped.

F. Piping shall be installed, whether indicated or not, so as to rise and/or drop to clear any and all conduits larger than 1", lighting fixtures, ductwork and heating mains, to maintain the desired clear heights. The Contractor shall consult with the other trades and facilitate the erection of the equipment and piping.

G. Run piping straight and as direct as possible. In general, form right angles with or parallel to walls or other piping. Risers shall be erected plumb and true.

H. After cutting, all pipes shall be reamed out to full bore and before erection the inside of all pipes shall be thoroughly cleaned.

I. No piping or work shall be concealed or insulated until all required tests have been satisfactorily completed and work has been approved by the Architect and all other authorities having jurisdiction.

J. Branch connections of the drainage systems shall be made with "Wye" and long "Tee-Wye" fittings, short ¼" bends, common offsets and double hubs will not be permitted. Short "Tee-Wye"" fittings are to be used in vertical piping only.

K. Cleanouts shall be provided at foot of all stacks, all changes of directions, at the ends of branch runs where shown, every 50'-0" and as required by Code, and shall be furnished as described under cleanouts.

L. Horizontal drainage pipe 3" – 6" shall be pitched 1/8" per foot downward in the direction of flow. Branch connections to stacks from fixtures shall pitch ¼" per foot. Horizontal drainage pipe 8" and larger shall be pitched 1/8" per foot as per 2015 international Plumbing Code adopted by NYS Table 704.1.

M. Furnish and install complete systems of ventilating pipes from the various plumbing fixtures and other equipment to which drainage connections are made. Ventilating pipes shall be connected within 2'-0" of the discharge of each trap and shall be individually piped to point above the ultimate overflow level of the fixture before connecting with any other vent pipe (in general, this will be approximately 3'-6" above the finished floor). Branches shall be arranged to pitch back to fixtures.

N. The individual vent pipes shall be collected together above flood level of fixtures in branch vent lines and connected to vent stacks. Wherever possible, vent stack offsets shall be made with 45 degree fittings. The heels of vent stacks shall be connected to adjacent soil stacks for purpose of draining condensation where possible. The waste of one fixture shall be connected to the base of each vent stack for the purpose of washing out any scales or dirt which may accumulate, or the soil stack shall be used to wash out the heel of the vent.

O. The tops of all soil and waste stacks shall be extended as additional ventilating pipes. The tops of all ventilating stacks shall run independently through the roof. Pipes smaller than 4" size shall be increased to 4" by means of approved increasers before passing through the roof slab.

P. All piping installed in finished areas shall be completely concealed within hung ceilings, furrings, soffits, pipe spaces, etc.

Q. Where complete concealment is impossible because of obstructions such as beams, ducts, lights, piping, etc., the Contractor shall not install any work before first consulting with the Architect and his instructions (written or revised Drawings) shall be followed.

R. All potable water systems shall be purged of deleterious matter and disinfected prior to utilization in accordance with 2015 International Plumbing Code adopted by New York State Section 610 and in compliance with applicable New York State Department of Health regulations.

S. Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees for pipe sizes 4" and larger.

T. Anchorage shall be provided to restrain drainage piping from axial movement. For pipe greater than 4", restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two pipe sizes.

U. Above-ground outdoor piping shall be installed not less than 3-1/2" above the ground and shall be securely supported and located where it will be protected from physical damage. Where piping passes through an outside wall, the piping shall be protected against corrosion by coating or wrapping with an inert material. Where piping is

encased in a protective sleeve, the annular space between the piping and the sleeve shall be sealed. Installation shall be in accordance with 2015 international Fuel Gas Code adopted by New York State.

END OF SECTION 221116

SECTION 221123
PUMPING EQUIPMENT

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The Work of this Contract includes providing all labor, materials, accessories, services and tests necessary to install complete and make ready for operation by the Owner, all Work as shown on Drawings and as specified hereinafter.

B. Provide insulation on all factory package assembled piping.

C. Provide spare parts and seals for each type of pump size.

D. Provide training for spare parts.

E. Installation of hot water return circulating pumps.

F. Installation of elevator sump pump.

G. Installation of duplex domestic booster pump.

1.3 SUBMITTALS

A. Product Data: For each packaged booster pump specified. Include the following:

1. System design information sheets indicating design parameters of system pressure and flow.

2. Pump type, capacity, power requirements, material and construction.

3. Pump curve indicating design point.

4. Detailed sequence of operation.

5. Packaged system dimension and general arrangement drawing.

6. Catalog information on major components.

7. Electrical power and control wiring diagrams with indication of field wiring connections.

8. System Warranty.

9. All of the above shall be specifically prepared and certified for this project.

B. Submittals which are generic and not specifically designed to meet the requirements of this project shall not be acceptable.

C. Shop Drawings: For packaged booster pumps and accessories. Include plans, elevations, sections, details, and attachments to other work.

D. Operation and Maintenance Data: For each packaged booster pump to include operation, and maintenance manuals.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written rigging instructions for handling.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.6 QUALITY ASSURANCE

A. Reference Standards:

1. ANSI/ASHRAE 90A: Energy Conservation in New Building Design.

2. ASME Section VIIID: Pressure Vessels; Boiler and Pressure Vessel Codes.

3. Hydraulic Institute

4. NEMA MG 1: Motors and Generators

5. NFPA 70: National Electrical Code

6. UL 508: Standard for Industrial Control Equipment

7. UL 778: for motor-operated water pumps

B. Manufacturing firms regularly engaged in manufacture of this material meeting all capacities and operating characteristics of the specified manufacturer's product whose products have been in satisfactory use, in similar service, for not less than ten (10) years. Manufacturer shall have in place a quality assurance program under ISO 9001.

C. The system shall be independently Third Party labeled as a system suitable for the intended use by a Nationally Recognized Testing Laboratory (NRTL) such as UL or ETL, in accordance with OSHA Federal Regulations and NFPA Pamphlet 70, the National Electric Code (NEC) Article 90-7. All packages for domestic water shall comply with ANSI/NSF 372 – Drinking Water System Components – Lead Content requirements.

D. Factory Test: The booster system and its component parts shall undergo a hydrostatic pressure and complete operating flow test from zero to 100% design flow rate under the specified suction and net system pressure conditions. This flow test shall be performed by supplying the control panel with the specified incoming voltage. Each pump's performance shall be tested over its full range of flow. All pressure regulators, pressure switches, and other devices shall be set and functions verified. Components shall be tested for hydraulic shock, vibration, or excessive noise. Testing shall also include a hi-pot voltage test of the system. Any parts found to be defective must be replaced prior to shipment. Full documentation shall be maintained by the manufacturer showing flow rates, pressures, and amp draws for future service and troubleshooting reference.

E. Certification: The final system certification shall include copies of the independent Third Party Certifications and test data as recorded by X-Y plotter. The specifying Engineer shall have the option to witness the test. The entire system shall be painted after testing.

F. The complete pumping system shall be guaranteed in writing by the manufacturer for a period of one year from date of startup or eighteen months from shipment, whichever comes first, against defects in materials and workmanship. Warranties and guarantees by the suppliers of various components in lieu of single-source responsibility by the manufacturer will not be accepted. The PLC, Touchscreen HMI, and VFD's shall also be warranted for 5 years by a single third-party. The services of a factory trained engineer shall be provided for start-up and instruction of maintenance personnel.

PART 2 PRODUCTS

2.1 HOT WATER RETURN CIRCULATING PUMP (HWCP1&2)

A. Furnish and install in hot water return circulating piping, Armstrong or approved equal in-line circulators.

B. Model numbers and sizes as scheduled on the Drawings.

C. Provide motor starters with proper size thermal overload and pilot light.

D. The recirculation pump shall be controlled by BMS.

E. CONSTRUCTION MATERIALS

1. Booster Body: Lead-Free Bronze
2. Face Plate: Stainless Steel
3. Impeller: Glass Filled PPS
4. Shaft: Stainless Steel
5. Seal: Mechanical, Carbon on Silicon Carbide

6. Motor Bearings: Sealed Precision Steel Ball Bearing Permanently Lubricated

7. Motor Type: ODP

8. Elastomers: EPDM

2.2 ELEVATOR PIT SUMP PUMP (SP1)

A. Provide, as shown on the plans, a simplex elevator pit sump pump system as manufactured by Stancor and represented by G. A. Fleet Associates of Harrison, NY. The installed pump and control system shall be a permanent installation in accordance with ASME Elevator Code A17.1. The control unit, pump, floats and sensor probe shall be factory assembled as a complete, ready to use system and shall be tested and approved by a nationally recognized testing laboratory such as ENTELA.

1. Elevator sump pump systems that do not function as described and have not been tested and certified, as a complete pump and control system by an NRTL shall not be accepted.

2. Manufacturer Basis of Design: Stancor – SE-50-GAF or equal.

a. The pump shall be a Stancor heavy duty submersible effluent type capable of passing a minimum 3/4" solid, approved to UL 778 standards. Construction features shall include cast iron casing and impeller, mechanical seals housed in a separate oil-filled compartment and 304 stainless steel motor housing. Refer to Schedule for characteristics and pit size.

b. The control system shall provide for fully automatic pump operation and alarm activation with individual LED indication in the event of:

1) High liquid level

2) Dry contacts for remote alarm signal

c. The control system shall include: pump control panel and dual floats for automatic pump operation and level alarm. The controls shall be factory assembled as a complete, ready to use system and shall be tested and approved to UL 508 standards.

d. The pump control panel shall be a NEMA 4X, watertight, dust tight, corrosion resistant, gasketed enclosure. The control panel shall include magnetic contactor with separate over-current relay, Audio-visual alarm station with light, horn, alarm silencing switch, auxiliary contact for common trouble alarm and clearly marked terminal board.

e. Pump and float cables, 16' each, shall be provided by the manufacturer.

1) Alternative longer cable lengths shall be provided as required, Contractor to coordinate.

f. Provide a steel frame and cover grating suitable for a concrete pit as shown on the drawings. The cover shall have all required openings for the pump discharge lines, float switches and pump removal.

2.3 DUPLEX DOMESTIC BOOSTER PUMP (BP1)

A. Manufacturers

1. Subject to compliance with all specified requirements, provide products as produced by the manufacture used as the basis of design. Other manufacturers, whose products have been in satisfactory use in similar service for not less than 10 years, may be submitted for approval as an equal provided the submission contains sufficient information for evaluation and the manufacturer certifies full compliance with the performance, physical characteristic requirements and all operational features of these Specifications.

2. Should the initial "Or, Equal" submittal be incomplete or otherwise fail to demonstrate "Or, Equal" status, no further submissions by the failed manufacturer will be reviewed.

B. Description: Factory-assembled and -tested, packaged, variable speed, booster pump with multiple pumps, piping, valves, sensors, and controls on skids or base, similar to SyncroFlo / Peerless - VFD-GAF Series.

1. Manufacturer Basis of Design

a. SyncroFlo / Peerless - GAF Series

b. Or, Approved equal.

2. System Working-Pressure Rating: See Schedule.

3. Pump Arrangement: Multiplex, with two equal-size pumps.

C. Pumps: Overhung impeller, close coupled, single stage, radially split case, end suction, centrifugal. Comply with UL 778 and HI 1.1-1.2 and HI 1.3.

1. Each Pump:

a. Orientation: Mounted horizontally.

b. Construction: Bronze fitted.

1) Casing: Radially split, cast iron with bronze casing wear ring.

2) Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, single suction, closed, and keyed to shaft.

3) Shaft and Shaft Sleeve: Steel shaft, with 416 stainless steel shaft sleeve.

4) Seal: Mechanical.

5) Pumps shall be capable of operation at any point on their performance curves without the restriction of a minimum flow limit for satisfactory operation.

6) Maximum speed 3565 RPM.

2. Motors: Single speed, with grease lubricated bearings, unless otherwise indicated open drip-proof enclosure, 1.15 service factor. Select motor that will not overload through full range of pump performance curve.

D. Packaging

1. All components shall be mounted on a structural channel or I-beam, steel or aluminum, skid suitable for grouting with all interconnecting piping and wiring completed.

2. Piping shall be schedule 40, 304 stainless steel or Type "L" copper. Dielectric fittings shall be used where joining dissimilar metals to prevent galvanic action and to stop corrosion. The piping shall be adequately supported independent of pump connections. It shall be arranged with adequate space for maintenance and to allow for removal of any pump without system shutdown. The suction and discharge manifolds piping shall be sized for a maximum velocity (7) FPS.

3. The factory assembled package shall be constructed to facilitate system installation and to provide for a field adaptable piping configuration as follows: the system base shall be split, allowing for ease of disassembly and reassembly, by the Contractor in the field; the suction and discharge manifolds shall be flanged on both ends allowing for field connection to either end of the suction and discharge headers.

   a. Contractor shall inspect the jobsite and be aware of access and space limitations. Contractor shall coordinate package construction with the manufacturer as required to suit jobsite conditions.

4. Full port ball type isolation valves shall be installed on the suction and discharge of each pump. Each pump shall be provided with a thermal safety purge valve for over temperature protection.

5. Each pump discharge line shall include a pilot operated diaphragm type combination pressure regulating and non-slam check valve, complete with opening speed control, stainless steel cover bolting and fully fused epoxy coating inside and out. Valves shall be set for higher than normal system pressure, functioning as safety devices to provide emergency pressure regulation in the event of full speed pump operation by means of the bypass starter due to a variable frequency drive failure.

6. Controller mounted, 4" diameter, glycerin filled, pressure gauges shall be provided for indication of suction, system, and individual pump discharge pressures. All pressure sensing lines for gauges or pressure switches shall be factory piped in copper with brass with shut-off valves.

7. The pumps and all components on the discharge side of the pumps shall have a rated working pressure greater than pump shut-off head plus maximum suction pressure. The contractor shall pipe all purge valve discharge lines and, when applicable, packing gland drains (separate from purge lines) to a floor drain and make piping interconnection with the precharged diaphragm tank, as shown on the plans.

E. Controls

1. Operating Sequence and Alarms:

a. The electrical control system shall start, stop and vary the speed of the pumps as required by system demand, via a single common PID controller. The lead pump shall run continuously with the ability to shutdown on no flow. Should the system demand exceed the capacity of the lead pump or should the lead pump fail to operate, the lag pump shall be started upon pressure drop. Upon drop in system flow, the pumps shall be stopped in reverse order. The pumps shall be automatically alternated. If any pump is out of service, pump sequencing shall be automatically shifted.

b. In the event of a low suction pressure condition, the pumps shall be cut-off and alarm shall be activated. Pumps and alarm shall automatically reset when conditions return to normal.

c. In the event of a low system pressure condition, the pumps shall be sequenced on and the alarm shall be activated. The pumps and alarm shall automatically reset when conditions return to normal.

d. In the event of a low system pressure condition caused by a drive failure, the automatic bypass circuit shall start pumps, in sequence following time delay across-the-line; alarm horn and light shall be energized. This alarm shall require a manual reset.

e. In the event of a high system pressure condition, the pumps shall be cut-off and alarm shall be activated. Pumps and alarm shall automatically reset when conditions return to normal.

f. In the event of a drive failure, the alarm shall be activated and the remaining pump shall be started.

g. In the event of a control power failure, the power failure relay shall activate an auxiliary alarm contact, no audible alarm.

h. In the event of a failure of a programmable logic controller ("PLC"), electronic pressure or flow sensor, a failure circuit shall activate redundant electromechanical controls and alarm (no audible) and a minimum of one pump shall operate automatically.

i. All alarms shall be audio-visual, except as noted, with silencing push-button and two (2) sets of Form "C" auxiliary alarm contacts for remote common system trouble alarm (2-NO, 2-NC).

j. All start/stop and alarm set points shall be field adjustable. Activation of all start/stop and alarm functions shall follow field adjustable time delays.

2. Pressure Sensors:

a. Pressure Transducers: Shall be factory mounted inside the control panel and factory piped to the to the suction and system headers. The transducers shall have 1.0% accuracy, stainless steel wetted parts and a waterproof enclosure. Transducers shall be IP67 rated, and capable of withstanding over

pressurization of double its range. The transducers shall use a digital 1-6 kHz pulse output that can be directly sent to a programmable logic controller (PLC) without requiring an additional analog module for measuring current. The transducers zero set point must be capable of field calibration.

b. Pressure Transducer: An additional transducer shall be field installed at the remote diaphragm tank. It shall be a Rosemount Model 2051GP, variable capacitance type with two wire 4-20 MA proportional signal for process by the programmable controller at the pump. Transducer shall be heavy duty, industrial grade having an operating temperature range of -20 degrees F to +200 degrees F and a continuously adjustable timing constant of .2 to 1.67 sec. and 2,000 PSI over-pressurization rating. Incorporated in the body shall be a 316SS air bleed. Transducer shall be capable of zero evaluation of 600% of calibrated span and a zero suppression of 500% of calibrated span.

Wiring for the remote pressure transducer shall be furnished and installed by the electrical contractor using a twisted shielded pair of #18 or larger wires carrying 4-20 milliamps DC.

c. Pressure Switches: Shall be non-mercury type.

3. Control Panel: Factory installed and connected as an integral part of unit complying with NEMA ICS 2 and UL 508; automatic for multiple-pump, variable and constant speed operation with load control and protection functions. It shall be arranged for single common power feed housed in a NEMA-12 enclosure, complete with the following:

a. Circuit breaker disconnect switches interlocked with compartment door, for each pump.

b. Three pole magnetic motor starters with three phase thermal overload protection and low voltage release, for VFD bypass, for each pump.

c. Bypass drive isolation contactors, separate, not integral with dirve.

d. 115 volt control circuit transformer fused on both the primary and secondary sides with circuitry for automatic transfer of primary to active power feed.

e. Control power available light with auxiliary alarm contacts.

f. H-O-A selector switches, for each pump.

g. Automatic pump alternator with manual override selector switch.

h. Pump run indicating lights.

i. Alarm indicating lights.

j. Audible alarm, silencing push-button and remote trouble alarm contacts.

k. Set of necessary control relays and other accessory devices required to permit the system to operate in conformance with the specifications.

l. Auxiliary contacts (Form "C" (1-NO, 1-NC)) for interface with building automation system, for the following:

1) Control power available.

2) On-off status of each pump.

3) Common system trouble alarm status.

m. Set of panel mounted pressure gauges and switches.

n. Color Touchscreen HMI (Human Machine Interface).

o. Programmable Logic Controller (PLC).

p. Building management system communication module for pump system data via BACNET /LONWORKS.

q. All components shall be mounted on back panels.

r. All internal wiring shall be numbered corresponding to the wiring diagrams.

4. Color Touchscreen HMI (Human Machine Interface) shall be flush mounted in the door of the control panel. It shall have the following features:

a. 320 x 240 resolution, 256 color, 3 MB memory, 5.7" screen size, 520 characters/screen, 300 touchpoints / screen.

b. Serial port (for PLC communication), USB port (for programming), and Compact Flash port (for troubleshooting and field-loading program changes).

c. The HMI shall be capable of direct communication with the VFD, in the event of a PLC failure.

d. The following data shall be accessible through the operator interface.

1) System status including current system pressure and setpoint, pump run status, the current speed of the pumps (in %), and the method of speed control. Display system status on all user screens.

2) A Set Points Menu system for adjusting set-points. Display and adjust pressure, VFD speed, power, minimum speed, lead pump shutdown mode, and tank pressurizer set points and time delays. Restore to either factory defaults or the last saved field defaults. Protect adjustable settings with a password.

3) Alarm History of the past 200 alarms. Each log shall include individual pump run status, system pressure and run setpoint, alarm type and the date and time. Alarm Type shall be in plain English, not codes requiring a reference list.

4) Alarm List of all possible alarms and their current status. Display any current alarms on all user screens.

5) Start-up instructions and checklist.

e. The HMI shall include a method for transferring data

1) Alarms shall automatically copy to an installed compact flash drive.

2) Include fault codes from the PLC and the VFD.

3) Copy usage data to the drive daily.

4) Data shall be stored in a text file, readable by non-proprietary software.

5) HMI Software shall allow for program changes to the HMI and PLC to be transferred via the compact flash drive.

5. The Programmable Logic Controller (PLC) shall be installed on the control panel base pan, not the door, to protect it from damage. The PLC manufacturer shall be clearly marked on the controller, and non-proprietary. The PLC shall continue to function even if the touchscreen is broken, damaged, or removed. The PLC shall have the following features: 32,000 steps of built-in program memory, 7680 auxiliary relays, 320 timers, 235 counters, 8000 data registers, 24,000 extension registers, and 24,000 extension file registers.

6. Variable Frequency Drives: Each pump shall have its own variable frequency drive with the following features:

a. The drive shall be a voltage source, GTR or IBGT power transistor based inverter - PWM Type. The inverter shall use a high carrier frequency to reduce drive and motor noise.

b. Drive shall be capable of operating in an ambient temperature between 15°F and 100°F and a line voltage variation of less than 10%.

c. Self-protection features shall include: under voltage and over voltage protection, current overload protection, short circuit protection, power failure protection, ground fault protection, and over-temperature protection.

d. A four digit LED readout shall be provided to indicate the following: drive enabled, output frequency, and all VFD fault conditions.

e. The drive shall be capable of automatically restarting after any of the following: overload over-voltage, converter over-current, inverter over-current, or power failure.

f. The following drive parameters shall be user adjustable: acceleration speed (1 to 300 seconds), deceleration speed (1 to 300 seconds), minimum speed, and maximum speed.

g. The drive shall have a front mounted "HAND-OFF-AUTO" selector switch and a potentiometer for adjusting drive speed in the "HAND" position.

h. The VFD shall use the following energy saving techniques

1) Slows down the motor

2) Reduce current

3) Reduces voltage

4) Evaluates 6 motor characteristics to further increase efficiency

i. VFD shall communicate with the PLC with a DIGITAL connection, with the following capabilities:

1) Able to modify 300 different VFD parameters through the PLC and HMI

2) Read all VFD data and communicate it to the PLC, HMI, and write to the compact flash drive.

j. VFD drives mounted external to the control panel shall have dust protection.

F. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and pump nozzles.

G. Service Contract: The manufacturer's representative shall include a one (1) year service contract. The service contract period shall commence upon owner acceptance of the equipment. The service contract shall include a complete system inspection twice a year including: check of proper pump sequencing and alarm activation with adjustments, as required; and review of instructions for operating personnel, if requested. Any required service work to be noted in a formal inspection report along with a detailed proposal for the repairs.

H. Capacity and Characteristics: See Schedule

2.4 PRECHARGED DIAPHRAGM TANK

A. Precharged pneumatic diaphragm tank, as manufactured by Amtrol, Inc., built in accordance with ASME Code. The tank shall be installed at the top of the building where indicated on the plans.

B. Tank shall be vertical mounted with the cold water inlet connection located on the bottom, 1/4" vent and air charging valve. All wetted metal parts must be brass or stainless steel.

C. The tank shall be field piped with pressure gauge, pressure sensor, isolation and hose bibb drain valves. The contractor shall precharge the tank to 5 PSI less than minimum system pressure at the point of connection.

D. Model, Capacity, Air Charge, Working Pressure and Location: See Schedule

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. All pumps shall be installed and comply with manufacture requirements.

B. Mechanical seals and shaft sleeves shall be replaced by this Contractor without charge in the event unusual wear or faulty operation occurs during guarantee period.

C. Where pump's components are or may come in contact, use hardness differentials of at least 50 Brinnell to prevent seizure and reduce wear, even though the materials may basically be similar.

D. Provide shaft packing or seals compatible with the pump's design, handle fluids in accordance with the manufacturer's recommendations.

E. Each pump

F. Upon completion of the installation, test all equipment under field operating conditions to demonstrate capability of the equipment to meet Specification requirements.

G. Submit results of factory tests with the equipment shop drawings. Include results of factory and field tests in the Instruction Manual.

H. Perform field tests to demonstrate the ability of the pumping equipment to meet Contract requirements. Compile and certify the following data:

1. Water flow, GPM, at rated head.

2. Shutoff head.

3. Operating kilowatts for measured voltage, amperes, power factor.

3.2 EXAMINATION

A. Examine roughing-in for packaged booster pumps to verify actual locations of connections before booster pump installation.

3.3 CONCRETE BASES

A. Install concrete bases of dimensions indicated for packaged booster pumps. Provided under general contractor scope. Coordinate installation location and size.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be imbedded.

4. Install anchor bolts to elevation required for proper attachment to supported equipment.

B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.4 BOOSTER PUMP INSTALLATION

A. Install packaged booster pumps level on concrete bases with access for periodic maintenance including removal of pumps, motors, impellers, couplings, and accessories.

1. Do not dismantle packaged booster pumps or remove individual components, without authorization from the manufacturer.

2. Pipe all packing glands to drain.

3. Pipe all thermal safety purge valves to drain, separate from packing gland drain piping.

4. Completely fill the base with non-shrinking grout prior to pump start-up.

B. Vibration Isolation: As specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

C. Support connected domestic water piping so weight of piping is not supported by packaged booster pumps.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect domestic water piping to packaged booster pumps. Install suction and discharge pipe equal to or greater than size of unit suction and discharge headers.

1. Install shutoff valves on piping connections to each booster pump suction and discharge headers. Install ball valves same size as suction and discharge headers. General-duty valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

2. Install union or flanged connections on pump suction and discharge headers at connection to domestic water piping.

3. Install piping adjacent to packaged booster pumps to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.6 STARTUP SERVICE

A. Prior to start-up the contractor shall perform the following:

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Check piping connections for tightness.

3. Clean strainers if any.

4. Verify that pump controls are correct for required application.

B. Engage a factory-authorized service representative to perform the following startup service:

1. Verify that pump controls are correct for the required application.

2. Verify bearing lubrication.

3. Align pump and motor in accordance with the manufacturer's guideline.

4. Prime pumps by opening suction valves and closing discharge valves, and prepare pumps for operation.

5. Start motors.

6. Open discharge valves slowly.

7. Verify that pump system operates in accordance with the specification, adjust settings as required.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting packaged booster pumps to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

3.7 LABELING AND IDENTIFICATION

A. Install identifying equipment markers and equipment signs on booster pumps. Labeling and identification materials are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain pumps. Refer to Division 01 Section "Demonstration and Training"

END OF SECTION 221123

SECTION 221124
TESTING AND ADJUSTMENTS

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The Work of this Contract includes providing all labor, materials, accessories, services and tests necessary to install, complete and make ready for operation by the Owner, all work as shown on the Drawings and as specified hereinafter.

1.3 REQUIREMENTS

A. All tests shall be made in the presence of the Architect or their representatives, and the local authorities having jurisdiction of the work to be tested, as may be directed; and at least 72 hours notice shall be given in advance of all tests.

B. The Work of this Contractor shall include the furnishing of all testing instruments, gauges, pumps, smoke machines, and other equipment required or necessary for tests, required by laws, rules and regulations and as specified.

C. Provide all other tests required by local inspectors and all other authorities having jurisdiction.

D. All appurtenances shall be operated after installation to determine whether or not they meet the requirements of the Specifications.

E. All defects disclosed in the work by tests and otherwise shall be made good or the Work replaced without additional cost to the Owner. No caulking on screwed joints, cracks or holes will be acceptable.

F. Tests shall be repeated after any defects disclosed thereby have been made good or the work replaced if it is deemed necessary.

G. All tests shall be made at the expense of the Contractor.

H. Tests are not permitted to be made with air except as noted.

I. Contractor to provide required test plug tee fittings during erection of pipe system.

J. If the pipe installation fails to meet testing requirements, the Contractor shall determine at his own expense the source or sources of leakage, and he shall repair or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of the tests after the leaks have been corrected.

K. All piping which is to be enclosed in partitions or hung ceilings shall be tested and made tight when directed by the Construction Supervisor and in adequate time to permit the

installation of partitions and ceilings. When necessary, the Contractor shall drain the piping and/or take over such precautions as required to prevent damage by freezing.

L. The Contractor shall also be responsible for the Work of other trades that may be damaged or disturbed by the tests, or the repair or replacement of his Work, and he shall, without extra charges, restore to its original condition any Work so damaged or disturbed.

M. The Contractor required to be a member of a nationally recognized balancing organization.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.1 INTERIOR DOMESTIC WATER SYSTEMS

A. Domestic cold, hot and hot water circulation system: The entire water supply system shall be tested to a hydrostatic pressure of 100 pounds per square inch or 1½ times the system pressure, whichever is greater, at lowest point of the water system in the building, and proved tight at this pressure before fixtures are installed. Water supply piping, if in any way concealed by structural work, shall be tested to the aforesaid pressure and proved tight before pipes are concealed.

B. The test pressure to be held for a period of not less than two (2) hours with a no change in pressure. If there is a drop in pressure, all repairs and alterations in the piping system necessary to meet the test shall be made.

C. The contractor to test the hot waters system to ensure system is balanced properly. Contractor to provide balancing report indicating flow at each balancing valve with valve tag number located on as-built drawings. Contractor to be a member of a nationally recognized Balancing organization.

D. Balancing Report Requirements:

1. Riser diagram showing location and valve tag of each balancing valve.

2. Flow at each balancing valve indicated on riser and corresponding spreadsheet.

3. Spreadsheet indicating total pressure – pressure: Velocity pressure and velocity pressure + GPM at each valve tag.

4. Spreadsheet showing Service or Designation, design GPM, model of valancing valve, size, measured DP FtHd at circuit, calculated GPM, valve setting, % design.

5. Spreadsheet with the following pump data:

Design
Manufacturer, Location, Service, Model #, Serial #, Design GPM/FtHd, Pump RPM

Motor
Manufacturer/Frame, Motor HP/RPM, Volts/Phase/Hertz, F.L. Amps/S.F.

Actual

Valve Shut Off, Act. Impeller Diam., Valve Open Diff., Valve Open GPM, Final Dischg. Press., Final Suction Press., Final △ P, Final GPM, Voltage, Amperage T1 / T2 / T3

6. Spreadsheet showing:

Floor No., pipe size, pipe material, mode, required GPM, actual test GPM, % design.

E. Backflow preventers are to be tested in accordance with NYS Plumbing code Section 312.10.

3.2 INTERIOR SANITARY WASTE AND STORM WATER SYSTEMS

A. The entire piping of the sanitary system and of the storm water system shall be tested with water in accordance with the 2015 International Building Code and Plumbing Code adopted by NYS and the Local Plumbing Inspector's requirements and proved tight before the trenches are backfilled or fixtures connected.

B. The water tests of the piping of the sanitary system and the piping of the storm water system shall comply with the requirements of the 2015 International Building Code and Plumbing Code adopted by NYS and all Local Authorities.

C. All drainage and vent systems shall be filled with water and proven tight under a 10'-0" head over new building roof for a minimum of two (2) hours. Water level must remain constant throughout test without adding water.

D. After all fixtures have been permanently connected to the sanitary system and the system is completed, a smoke test shall be applied to the sanitary system, and the entire system proved tight to the satisfaction of the Architect, when filled with smoke under pressure equal to 1" column of water for a minimum of 15 minutes. The smoke shall be produced by a smoke generating machine and not be chemical mixtures.

3.3 SUMP PUMP DISCHARGE PIPING

A. Test sump pump discharge piping before placing system in service or concealing system, to ensure that piping is tight. Testing, inspection and purging of piping systems shall comply with Section 312.7 of the 2015 International Plumbing Code adopted by New York State. Piping shall be tested at 5psi greater than the pump rating with a minimum testing of 50 psig and maintained such pressure for 15 minutes.

3.4 NATURAL GAS SYSTEMS

A. Test gas piping before placing system in service or concealing system, to ensure that gas piping is tight. Testing, inspection and purging of piping systems shall comply with Section 406 of the 2015 International Fuel Gas Code adopted by New York State.

B. SECTION 406 INSPECTION, TESTING AND PURGING

1. 406.1 General. Prior to acceptance and initial operation, all piping installations shall be visually inspected and pressure tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of this code.

a. 406.1.1 Inspections. Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly, or pressure tests.

b. 406.1.2 Repairs and additions. In the event repairs or additions are made after the pressure test, the affected piping shall be tested. Minor repairs and additions are not required to be pressure tested, provided that the work is inspected and connections are tested with a noncorrosive leak-detecting fluid or other approved leak-detecting methods.

c. 406.1.3 New branches. Where new branches are installed to new appliances, only the newly installed branches shall be required to be pressure tested. Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or other approved leak detecting methods.

d. 406.1.4 Section testing. A piping system shall be permitted to be tested as a complete unit or in sections. Under no circumstances shall a valve in a line be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, except where a double block and bleed valve system is installed. A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve-closing mechanism, is designed to safely withstand the test pressure.

e. 406.1.5 Regulators and valve assemblies. Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed shall be permitted to be tested with inert gas or air at the time of fabrication.

2. 406.2 Test medium. The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used.

3. 406.3 Test preparation. Pipe joints, including welds, shall be left exposed for examination during the test. Exception: Covered or concealed pipe end joints that have been previously tested in accordance with this code.

a. 406.3.1 Expansion joints. Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test.

b. 406.3.2 Appliance and equipment isolation. Appliances and equipment that are not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges, or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested.

c. 406.3.3 Appliance and equipment disconnection. Where the piping system is connected to appliances or equipment designed for operating pressures of less than the test pressure, such appliances or equipment shall be isolated from the piping system by disconnecting them and capping the outlet(s).

d. 406.3.4 Valve isolation. Where the piping system is connected to appliances or equipment designed for operating pressures equal to or greater than the test pressure, such appliances or equipment shall be isolated from the piping system by closing the individual appliance or equipment shutoff valve(s).

e. 406.3.5 Testing precautions. Testing of piping systems shall be performed in a manner that protects the safety of employees and the public during the test.

4. 406.4 Test pressure measurement. Test pressure shall be measured with a manometer or with a pressure-measuring device designed and calibrated to read, record or indicate a pressure loss caused by leakage during the pressure test period. The source of pressure shall be isolated before the pressure tests are made. Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than five times the test pressure.

   a. 406.4.1 Test pressure. The test pressure to be used shall be no less than 1-1/2 times the proposed maximum working pressure, but not less than 3 psig (20 kPa gauge), irrespective of design pressure. Where the test pressure exceed 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.

   b. 406.4.2 Test duration. Test duration shall be not less than 1/2 hour for each 500 cubic feet (14 m3) of pipe volume or fraction thereof. When testing a system having a volume less than 10 cubic feet (0.28 m3) or a system in a single family dwelling, the test duration shall be not less than 10 minutes. The duration of the test shall not be required to exceed 24 hours.

5. 406.5 Detection of leaks and defects. The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction of test pressures as indicated by pressure gauges shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause.

   a. 406.5.1 Detection methods. The leakage shall be located by means of an approved gas detector, a noncorrosive leak detection fluid or other approved leak detection methods.

   b. 406.5.2 Corrections. Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

6. 406.6 Piping system, appliance and equipment leakage check. Leakage checking of systems and equipment shall be in accordance with Sections 406.6.1 through 406.6.4.

   a. 406.6.1 Test gases. Leak checks using fuel gas shall be permitted in piping systems that have been pressure tested in accordance with Section 406.

   b. 406.6.2 Before turning gas on. During the process of turning on into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all valves at unused outlets are closed and plugged or capped.

   c. 406.6.3 Leak check. Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage. Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made

d. 406.6.4 Placing appliances and equipment in operation. Appliances and equipment shall be permitted to be placed in operation after the piping system has been checked for leakage in accordance with Section 406.7.2 the piping system has been purged in accordance with section 406.7 and the connections to the appliances have been checked for leakage.

7. 406.7 Purging. Purging of piping shall comply with Sections 406.7.1 through 406.7.4.

a. 406.7.1 Piping system required to be purged outdoors. The purging of piping systems shall be in accordance with the provisions of section 4067.1.1 through 406.7.1.4 where the piping system meets either of the following:

a. The design operating gas pressure is greater than 2 psig (13.79 kPa).

b. The piping being purged contains one or more sections of piping or tubing meeting the size and length criteria of Table 406.7.1.1.

2) 406.7.1.1 Removal from service. Where existing gas piping is opened, the section that is opened shall be isolated from the gas supply and the line pressure vented in accordance with section 406.7.1.3. Where gas piping meeting the criteria of Table 406.7.1.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas.

3) TABLE 406.7.1.1 SIZE AND LENGTH OF PIPING

NOMINAL PIPE SIZE (inches)	LENGTH OF PIPING REQUIRING PURGING
2-1/2	> 50 feet
3	> 30 feet
4	> 15 feet
6	>10 feet
8 or larger	Any Length

For SI: 1 Inch = 25.4 mm, 1 foot = 304.8 mm.

4) 406.7.1.2 Placing in operation. Where gas piping containing air and meeting the criteria of Table 406.7.1.1 is placed in operation, the air in the piping shall be displaced an inert gas. The inert gas shall then be displaced with fuel gas in accordance with section 406.7.1.3.

5) 406.7.1.3 Outdoor discharge of purged gases. The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. Purging operations shall comply with all of the following requirements:

a. The point of discharge shall be controlled with a shutoff valve.

b. The point of discharge shall be located note less than 10 feet (3048 mm) from a source of ignition, not less than 10 feet (3048mm) from building openings and note less than 25 feet (7629 mm) from mechanical air intake openings.

c. During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with section 4067.1.4.

d. Purging operations introducing fuel gas shall be stopped when 90 percent fuel gas by volume is detected within the pipe.

e. Person not involved in the purging operations shall be evacuated from all areas within 10 feet (3048 mm) of the point of discharge.

6) 406.7.1.4 Combustible gas indicator. Combustible gas indicators shall be listed and shall be calibrated in accordance with the manufacture's instructions. Combustible gas indicators shall numerically display a volume scale from zero percent to 100 percent in 1 percent or smaller increments.

b. *406.7.2 Piping systems allowed to be purged indoors or outdoors. The purging of piping systems shall be in accordance with the provisions of section 406.7.2.1 where the piping system meets both of the following:*

1) The design operating gas pressure is 2 psig (13.79 kPa) or less.

2) The piping being purged is constructed entirely from pipe or tubing not meeting the size and length criteria of table 406.7.1.1.

a. 406.7.2.1 Purging procedure. The piping system shall be purged in accordance with one of the following:

(1) *The piping shall be purged with fuel gas and shall discharge to outdoors.*

(2) *The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.*

(3) *The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.*

(4) *The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with section 406.7.2.2. Purging shall be stopped when fuel gas is detected.*

(5) *The piping shall be purged by the gas supplier in accordance with written procedures.*

b. 406.7.2.2. Combustible gas detector. Combustible gas detectors shall be listed and shall be calibrated or tested in accordance with the manufacture's instruction. Combustible gas detectors shall be capable of indicating the presence of fuel gas.

3) 406.7.3 Purging appliances and equipment. After the piping system has been placed in operation, appliances and equipment shall be purged and then placed in operation.

END OF SECTION 221124

SECTION 221319
PLUMBING EQUIPMENT, SPECIALTIES AND ACCESSORIES

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 230000 - Special Requirements for Mechanical and Electrical Work shall apply.

C. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The Work of this Contract includes providing all labor, material, equipment, accessories, services, and tests necessary to complete and make ready for operation by the Owner, all work as shown on the Drawings and hereinafter specified.

PART 2 PRODUCTS

2.1 ESCUTCHEONS

A. This Contractor shall provide escutcheons on all exposed pipe wherever they pass through floors, ceilings, walls or partitions.

B. Escutcheons for pipes passing through outside walls and floors shall be Ritter Pattern and Casting Co., No. 1, solid, cast brass, flat type secured to pipe with set screws.

C. Escutcheons for pipes passing through interior walls, partitions, and ceilings shall be Ritter Pattern and Casting Co., No. 1, solid, cast brass chromium plated type, secured to pipe with set screws.

D. Escutcheons for pipes in unfinished areas shall be cast iron, secured with set screws.

2.2 TRAPS

A. Each fixture and piece of equipment requiring connection to the drainage system shall be separately trapped by means of a water seal trap placed as close to the fixture as possible.

B. All running traps on drains, etc., shall have inlet handhole cleanouts and brass plug cleanouts in bottom. Cast iron traps below grade shall have bottom plug omitted. All exposed P traps shall have bottom cleanouts and shall be chromium plated brass.

2.3 DISSIMILAR METALS

A. Connections between pipe, fittings, hangers and equipment of dissimilar metals shall be avoided.

B. Dielectric unions or insulated couplings shall be installed between copper or brass piping material and steel piping material or steel tanks. Unions or insulated couplings shall be

used for pipe sizes 2" and smaller, and use dielectric gaskets on flanges and sleeves for pipes 2½" and larger.

C. Pipes, fittings, hangers, etc., of dissimilar metals shall be insulated against direct contact with each other by using a high quality or grade of dielectric insulating material.

2.4 PIPE SLEEVES

A. Any pipe required in walls and floors shall be provided with a pipe sleeve.

B. Provide watertight sleeves for all pipes penetrating exterior foundation walls and waterproof floor areas and where other waterproof areas are noted on the Architectural and Structural Drawings.

C. Except where indicated or specified otherwise, provide and install Schedule 40 galvanized steel sleeves for all piping passing through concrete walls or floor slabs. Sleeves shall be securely set in the framework and where not specified otherwise shall be of such length as to extend flush with each face of the wall in which they are installed. Sleeves shall be securely set in floors 3" above unfinished floor and 2" above the finished floor or tile, as applicable. Sleeves in kitchen and laundry areas shall be chrome plated.

D. Sleeves shall have an internal diameter of at least 1" larger than the outside pipe size diameter of the pipe passing through them. Sleeves in exterior foundation walls shall be James B. Clow and Sons, No. F-1430 or F-1435, or approved equal, extra-heavy cast iron wall sleeves with intermediate integral flange. Cast iron sleeves shall be set with ends flush with wall faces.

E. Where sleeves penetrate waterproofing, install caulking between pipes and pipe sleeves as follows:

1. Provide waterproof mechanical seal such as link-seal or equal, see details for more information.

F. Sleeves for gas piping shall extend 4 inches beyond exterior face of wall and 1 inch beyond inner face.

G. Sleeves in waterproof floors shall be as manufactured by Zurn Inc. or equal, cast iron sleeve with integrally cast flange and flashing device.

2.5 STACK SLEEVES

A. Stack sleeves for pipes passing through roof shall be equal to Zurn Z-195-10, with cast iron body, adjustable flashing ring, rust resistant bolts, and under deck clamp. The adjustable flashing ring shall be caulked after it is in the proper position. The space between the flashing sleeve and the pipe passing through same shall be caulked watertight.

2.6 UNIONS

A. Where Required

1. On inlet and outlet of all apparatus and equipment having connections 2" and smaller. Where valves are adjacent to equipment, unions shall be on equipment side of valves.

B. Type

1. Steel piping: Malleable iron, WOG female pattern, brass seat, ground joint, 300 lb.

2. Copper tubing: Ground joint, cast iron, 150 lb. WOG pattern.

3. For piping over 2" flanged joints to be used.

a. Gaskets shall be 1/16" thick similar to Garlock or Cranite factory cut, one piece.

2.7 SHOCK ARRESTORS

A. Install permanently sealed shock arrestors on all hot and cold water branches and headers to plumbing fixtures whether indicated on the Plumbing Drawings or not.

B. Shock arrestors are to be of size and location in accordance with the manufacturer's recommendations and with DPI Standard WH 201, shock arrestors shall be PDI approved.

C. Provide accessibility to all shock arrestors.

D. Provide shock arrestors at all quick closing valves, solenoid valves and at equipment such as washing machines, etc.

E. The shock arrestors shall be Jay R Smith and shall be installed as per manufacturer's recommendation. See domestic water riser diagram for schedule.

2.8 HOSE BIBBS

A. Hose bibbs shall be Chicago Faucets #952 or approved equal, with vacuum breaker and loose key except as specified herein. Combination hot and cold hose bibbs shall be Chicago #305-VBC.P. or approved equal; modify for piped mounting less loose flange.

2.9 WALL HYDRANTS

A. Provide ¾" non-freeze wall hydrants where indicated on Drawings. Wall hydrants shall be J.R. Smith No. 5509 QT or approved equal, all bronze with bronze working parts throughout with a nickel bronze face, renewable nylon seat, vacuum breaker, lockable, and recessed box.

2.10 THERMOMETERS

A. Thermometers shall be adjustable angle type with red reading organic liquid, 7" black baked enamel case, black on white scale, a range from 30°F. to 240°F, and a separable brass socket. Thermometers shall be so installed and adjusted that they are easily readable from a normal standing position on the floor. Thermometers shall be similar or approved equal to U.S. Gauge "Multi-Angle".

2.11 PRESSURE GAUGES

A. Pressure gauges shall have 3½" diameter black enamel cast aluminum case with threaded brass ring, heavy glass, phosphor bronze bushed, rotary precision movement and dial ranges of 0 to 100 psi for water service. Pressure gauges shall be similar or approved equal to Trerice Co. No. 500X, with brass tee handle cock.

2.12 VACUUM BREAKERS

A. Provide vacuum breakers on water supply piping to each fixture and piece of equipment with submerged inlets, and on faucets and outlets within the building to which hoses can be or are attached. Set vacuum breakers in exposed readily accessible locations and at least 6'-6" above finished floor. Vacuum breakers shall be chrome plated brass, T&S Brass No. B-929-A or approved equal.

2.13 FIXED AIR GAPS

A. Provide a fixed air gap where indicated on the Drawings and required by Code for indirect wastes to prevent contamination from possible backflows from a sanitary drain line. Air gap shall be Zurn No. Z-1025 to suit piping installation. Fixed air gap finishes shall match connecting pipe finishes.

2.14 FIXTURE STOPS

A. Provide fixture stops as manufactured by the Dole Valve Company or approved equal. Fixture stops are to be installed in accordance with the manufacturer's recommendations and shall be provided for all sinks, lavatories and electric water coolers.

B. All Lavatories: Dole Model #FMA $^{3}/_{8}$" male pipe inlet and $^{3}/_{8}$" female pipe outlet for rigid hot and cold supply risers. Flow rate 0.5 gpm.

C. All sinks including equipment with sinks, mop receptors, service sinks and kitchen sinks, showers shall be Dole Model #FMC male pipe inlet and ½" female pipe outlet for hot and cold supply risers. Flow rate 4 gpm for service sinks and mop receptors, 3 gpm for kitchen and casework sinks, 2.5 gpm for showers.

D. Electric Water Coolers: Dole Model #F3/4C male pipe inlet and $^{3}/_{8}$" female pipe outlet for cold supply riser. Flow rate 0.5 gpm.

E. All exposed-to-view fixture stops and related piping shall be chrome plated nickel, or nickel plated.

2.15 DRAINS

A. Drains shall have heavy cast iron, with double drainage flange and weep holes, with outlet connections as indicated and of sizes indicated on Drawings. Drains (except as noted) shall be furnished with high polished brass tops consisting of a one-piece rim secured to the body and vandal-proof spanner type screws, and a solid brass grate with reinforcing members on underside. Removable sediment basket shall be of heavy duty one-piece construction as specified hereinafter. All strainers or grates shall be secured with vandal-proof spanner type screws, unless otherwise specified.

B. All drains in floors with a waterproof membrane shall be equipped with 20 oz. soft rolled sheet copper and secured to the flashing flange with brass bolts and cast iron clamping device. Flashings shall bond not less than 1'-0" on all sides into membrane waterproofing.

C. Flashing of 20 oz. soft rolled sheet copper, 34" x 34", shall be furnished and installed at each roof drain by means of non-puncturing type flashing clamping device.

D. Set all drains in such a way that the floor finish and top of the drain will be plumb and flush with finish floor without requirements for future additional extension, modifications, etc.

E. When Dex-O-Tex and/or vinyl waterproof floor is indicated on the Architectural Drawings, all drains must be provided with required flanges.

F. All drains, except as noted, shall be similar to or equal to Zurn Mfg. Co. and shall be as scheduled on the drawings.

G. FD-A - ENGINEERING SPECIFICATION: ZURN ZN415B-VP Floor and shower drain, Dura-Coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with seepage slots and "TYPE B" polished nickel bronze, light-duty strainer. Shall be provided with trap seal to prevent emission of sewer gases.

H. FD-B - ENGINEERING SPECIFICATION: ZURN Z521-Y 12 [305] Diameter top drain, Dura-Coated cast iron body with bottom outlet, seepage pan and adjustable extension frame with heavy-duty tractor grate. Shall be provided with trap seal to prevent emission of sewer gases.

I. FFD-B - ENGINEERING SPECIFICATION: ZURN Z326 7" [178mm] or 9" [229mm] Diameter indirect waste funnel with Dura-Coated cast iron body and bottom outlet. Shall be provided with trap seal to prevent emission of sewer gases.

J. AD - ENGINEERING SPECIFICATION: ZURN Z556-Y-VP 8" [203mm] Diameter top drain, Dura-Coated cast iron body with bottom outlet, seepage pan and combination membrane flashing clamp and frame for adjustable extension with heavy-duty slotted cast iron grate

2.16 CLEANOUTS

A. Provide easily accessible cleanouts where indicated; at base of vertical stacks and leaders, at ends of horizontal drainage lines and at intervals not exceeding 50 ft., at each change of direction, on hand holes of running traps, and where indicated to make entire drainage system accessible for rodding. Provide at least 18 inch clearance to permit access to cleanout plugs.

B. Cleanouts for cast iron pipe shall consist of tapped extra heavy cast iron ferrule caulked into cast iron fittings, and extra heavy brass screw plug with solid hexagonal nut.

C. Cleanouts turning out through walls and up through floors shall be made by long sweep ells of "Y" and 1/8 bends with plugs and face or deck plates to conform to architectural finish in room. Where no definite finish is indicated on the Architectural and/or Mechanical Drawings, wall plates shall be chrome plated cast brass and floor plates shall be nickel bronze. Screws in cleanouts in finished areas shall be vandal-proof.

D. Cleanouts shall be full size at the pipe up to and including 6 inch pipe. On larger size piping, 6 inch size plugs shall be used.

E. The following schedule indicates the various types of cleanouts desired at various locations indicated on the Drawings. These cleanouts have been selected from the catalog of Zurn and are representative of quality design and finish desired. Cleanouts of Josam Mfg. Co., or J.R. Smith may be submitted provided they meet Specifications fully in

every respect (such as material, weight, clamping features, finish, etc.). The characteristics and quality of the cleanout shall be as follows.

1. Cleanout fitting in vertical stacks shall consist of tapped tees, capable of receiving a rough brass raised head cleanout plug; Zurn 1460-8.
2. Cleanouts in Mechanical Equipment Rooms shall be Zurn 1420-25.
3. Cleanouts in finished areas shall be Zurn Z-1420-3 or Z-1420-7 with recess for tile floors.
4. Cleanouts in Dex-O-Tex waterproof floors shall be Zurn No. Z-1405-18 with extra heavy duty top.
5. Cleanouts for 3 or more fixtures piped horizontally shall be extended to wall cleanouts, and shall be Zurn No. Z-1470.
6. All cleanout plugs shall be brass and lubricated with graphite before installation.

2.17 WATER METER

A. Install water meter furnished by the BMS contractor.

B. Refer to Division 23 for water meter, submit for confirmation of sizing.

2.18 GAS METER

A. Install gas meter furnished by the BMS contractor.

B. Refer to Division 23 for gas meter, submit for confirmation of sizing.

2.19 GAS REGULATOR

A. Spring-loaded, selfoperated regulator with an adjustable loading ring for controlled boost at higher flows and a 1" internal relief valve, an adjustable loading ring for controlled boost at higher flows, and a precision breather opening to ensure proper stability for all conditions. The regulator shall be rated to be used on low or intermediate inlet pressures where an internal relief or other type of overpressure protection device is not required.

2.20 TRAP SEAL

A. Trap Seal shall be device for use with all floor drains to minimize trap evaporation. Product is comprised of an ABS rigid structure, silicone gasket and seal for 2" [51 mm], 3" [76 mm], 3-1/2" [89 mm], and 4" [102 mm] sizes. Device is engineered to comply with the performance requirements of ASSE 1072 standard and is third party listed with IAPMO (UPC), ICC (ICC cES PMG) and ASSE. Trap Seal shall be Zurn Series Z1072 or approved equal.

2.21 LINT INTERCEPTOR

A. ZURN see schedule on drawings for model Acid Resistant Coated interior and exterior fabricated steel lint interceptor with non-skid secured cover, stainless lint intercepting secondary screen assembly and permanent primary straining baffle, and acid resistant coated interior and exterior fabricated steel extension section (specify overall height at time of shop drawings). Regularly furnished with high inlet and low outlet or approved equal.

2.22 STRAINER

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.

2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.

3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

4. Screen: Stainless steel with round perforations unless otherwise indicated.

5. Perforation Size:

a. Strainers NPS 2 and Smaller: 0.020 inch.

b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.

6. Drain: Factory-installed, hose-end drain valve.

PART 3 EXECUTION

(NOT USED)

END OF SECTION 221319

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SECTION 221320
DOMESTIC HOT WATER HEATERS

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The Work of this Contract includes providing all labor, materials, accessories, services and tests necessary to install complete and make ready for operation by the Owner, all Work as shown on Drawings and as specified hereinafter.

1.3 ENERGY CONSERVATION

A. Water heaters shall comply with New York State Energy Code requirements and thermal efficiency requirements of the current edition of ASHRAE/IESNA 90.1 Standards.

PART 2 PRODUCTS

2.1 GAS FIRED COPPER TUBE WATER HEATER SYSTEM (WH1&2)

A. CONSTRUCTION

1. Each water heater shall be ETL Listed; ASME Section IV (HLW) coded and stamped and shall incorporate a negative Pressure gas valve on each exchanger capable of full fire operation at of 2.5" WC of Gas pressure. Each unit shall achieve a minimum turn down 8.3 per 250,167 BTU of input. The total water content in the system shall be less than 2 Gallons per 250,167 BTU/hr of input. System shall consist of a quantity of Water Heaters Model: iQ1501, Gen II each with an input of 1501 MBH, output of 1380 MBH, 1662GPH, (27.7 GPM) at 40-140 ^{o}F when fired with natural gas, turndown ratio 50:1, (CO emissions of less than 400 ppm) 6 - 250,167 Btu Heat Exchangers.

2. Description: Water heater shall be direct fired, fully condensing, water-tube design. Power burner shall have full modulation. The minimum firing rate shall not exceed 30,000 BTU/HR input. Water heaters that have an input greater than 30,000 BTU/Hr at minimum fire will not be considered equal. The water heater shall have the capability of discharging into a positive pressure vent. Water heater thermal efficiency shall increase with decreasing load (output), while maintaining set point. Water heater shall have an operational set point capability of 100 ^{o}F to 190 ^{o}F and shall maintain the outlet temperature within an accuracy of +/- 4 ^{o}F during load changes of up to 30% rated capacity. Water heater shall be factory-fabricated, factory-assembled and factory-tested, water-tube condensing water heater with heat exchanger sealed pressure-tight, built on a steel base, including a sealed insulated sheet metal enclosure that acts as combustion-air intake plenum with a built in serviceable air filter.

3. Heat Exchanger: The heat exchanger shall be constructed with 316L stainless steel helical water tube, fully floating with no welded joints in the exchanger. The exchanger will have a single-pass unitary design (no separate primary and secondary heat exchanger). The water tubes shall be 0.75" ID, with no less than 0.0472" wall thickness. The heat exchanger shall be ASME Sect IV (HLW) stamped for a working pressure not less than 160 psig.

4. Modulating Air/Fuel Valve and Burner: The water heater burner shall be capable of a - 50 to1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. The burner shall be stainless fiber mesh covering a stainless steel body with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input. A variable frequency drive (VFD), controlled pre-mix blower shall be used to ensure the optimum mixing of air and fuel between the air/fuel valve and the burner.

5. Serviceability: Units shall have controls such that there is zero downtime for the customer when being serviced. Heat exchangers shall have individual control so they are able to run when other heat exchangers are being serviced.

6. The exhaust manifold shall be of polypropylene with 6" diameter flue connection.

7. Ignition: Ignition shall be via spark ignition with 100 percent main-valve shutoff and dual electronic flame supervision.

B. CONTROLS

1. Refer to Division 23, Section "Instrumentation and Control of HVAC."

2. Provide optional BACnet communications interface card.

3. The water heater control system shall be a Masterless Cascading design with no-master - slave designation. The entire system shall have built-in usage optimization routine.

4. The control panel shall consist of one individual circuit. The circuit boards shall include:

   a. A Digital touch display to indicate temperature and status

   b. A CPU board housing all control functions

   c. Each board shall be individually field replaceable.

5. The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.

6. The unit shall have a selectable exhaust temperature limit suitable for venting with PVC or CPVC/Polypropylene/Stainless Steel (AL29-4C).

7. The controls shall annunciate water heater and sensor status and include extensive self-diagnostic capabilities.

a. Set point High Limit: Set point high limit allows for a selectable maximum water heater outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a closed loop function that automatically limits firing rate to maintain outlet temperature.

8. The water heater control system shall incorporate the following additional features for enhanced external system interface:

   a. Temperature set point

   b. High Exhaust temp monitor and control. Turn down the Gas valve until the exhaust temp is kept below selected material (PVC, CPVC).

   c. Cascading via RS232

   d. Error Code Display / Error Code History

      1) Blower Fault

      2) Blocked Flue Fault

      3) Ignition Failure

      4) Temp Sensor Short

      5) Temp Sensor Wiring Fault

      6) Flue Temp Fault

      7) Heat Exchanger Temp Fault

      8) Cascading Fault

      9) Water Valve Fault

      10) Pump Fault

      11) Software Fault

   e. Monitor and access to daily, weekly, monthly water usages data.

   f. Monitor inlet/outlet temperatures, flow rates, flue gas temperatures, combustion rates via onboard touchscreen and via IoT app.

9. Water Heater Management: the water heater control system shall incorporate onboard multi-unit sequencing logic that would allow Masterless Cascading (Not Lead/Lag) functionality & sequencing between multiple water heaters operating in parallel and must have the following capabilities:

   a. Efficiently sequence 2 up to 24(6,000,000 Btu) heat exchangers on the same system to meet the load requirement.

   b. Individual heat exchanger logic to enable accurate temperature control.

c. Operate one motorized valve per heat exchanger as an element of the load sequencing, Valves must always stay open for recirculation.

d. Automatically rotate Start/Stop amongst the heat exchangers in the chain based upon an internal calculation of run hours, water through put, burner starts and stops and length of time each burner has been firing. Sequencing is not based upon next in line (Lead/Lag), it is based upon the most logical (least used) heat exchanger in an effort to equalize unit run hours.

e. Automatic bump-less transfer of sequencing in case of heat exchanger failure. All systems must be able to fail all but one heat exchanger in any order or for any reason and the last will continue to operate.

f. Each heat exchanger will default to individual control upon failure of the sequencing chain.

g. Automatic isolation of heat exchanger module from water circuit in case of failure and prevention of cold water from exiting the system

h. Masterless control, change any parameter in any one of the units and all the rest in the series will automatically adjust to the most recent parameter change.

C. ELECTRICAL POWER

1. Controllers, Electrical Devices and Wiring: Electrical devices and connections are specified in Division 26 sections.

2. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers and other electrical devices shall provide a single-point field power connection to the water heater.

3. Electrical Characteristics:

a. Voltage: 120 V

b. Phase: Single

c. Frequency: 60 Hz

d. Full-Load Current 5 Amps or less per 250,000 BTU of heat input

D. CONDENSATE

1. Condensate traps, manufactured from only non-corrosive materials.

2. Smart condensate neutralizer (telliBot iB300i) with capability of monitoring pH levels. Smart Neutralizer to also include:

a. Monitor water temperatures

b. CO detection, flue gas detection, water leak detection of boiler room w/ audible/visual alarms and alerts via app.

c. Water flow recording/monitoring

d. View history of above parameters via app.

E. VENTING

1. Refer to Division 23.

F. SOURCE QUALITY CONTROL

1. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions and carbon monoxide in flue gas, and to achieve combustion efficiency.

2. Live-fire Test and inspect factory-assembled water heaters, before shipping.

3. Allow Owner access to source quality-control testing of water heaters.

2.2 ELECTRIC INSTANTANEOUS WATER HEATER SYSTEM (WH3)

A. Chronomite Instant-Temp ER-120L/208_3P ® - High Capacity - 3 Phase – Low Activation - L3 models are manufactured to provide reliable hot water with flow rate from 0.35 gpm to 4.5 gpm. There is no pressure and temperature relief valve needed (unless required by code), saving time and money on installation.

PART 3 EXECUTION

3.1 CERTIFIED DRAWING

A. A descriptive certified dimensional outline drawing shall be submitted for approval, showing all instrumentation, controls and design details as specified herein.

3.2 INSTALLATION

A. Install water heaters level and plumb in accordance with manufacturers written instructions and referenced standards.

3.3 FINAL ASSEMBLY

A. The entire heater shall be factory assembled and tested, requiring only connection to services. Complete operating, adjustment and start-up instructions shall be provided in booklet form.

3.4 EXAMINATION

A. Before water heater installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations. Examine piping and electrical connections to verify actual locations, sizes and other conditions affecting water heater performance, maintenance and operations.

1. Final water heater locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where water heaters will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 WATER HEATER INSTALLATION

A. Install water heaters level on concrete bases. Concrete base is specified in Division 23 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 03.

B. Install gas-fired water heaters in accordance with

1. Local, states, provincial and national codes, laws, regulations, and ordinances.

2. National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition.

3. National Electrical Code, ANSI/NFPA 70 - latest edition.

4. Canada only: CAN/CGA B149 Installation Code and CSA C22.1 CEC Part 1.

5. Manufacturer's installation instructions, including required service clearances and venting guidelines.

C. Assemble and install water heater trim.

D. Install electrical devices furnished with water heater but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.6 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 sections. Drawings indicate general arrangement of piping, fittings and specialties.

B. Install piping adjacent to water heater to permit service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect gas piping to water heater gas valve with unions. Piping shall be at least full size of gas train connection. Provide a reducer if required.

E. Connect hot-water piping to supply and return water heater tappings with shutoff valve and union or flange at each connection.

F. Multiple heaters shall be piped such that all cold water entering the system will go through the heat exchanger first. A series of approved piping installation examples are shown in the installation and maintenance manuals provided with the unit. Each water heater shall have individual isolation valves for servicing and a hot water hose connection for start-up and field testing.

G. Install piping from safety relief valves to nearest floor drain.

H. Water heater Venting

1. Install flue venting kit and combustion-air intake.

2. Connect venting full size to water heater connections. [Comply with requirements in Division 23 Section "Breechings, Chimneys and Stacks."]

I. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

J. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections

1. Installation and Startup Test: Perform installation and startup checks according to manufacturer's written instructions.

2. Leak Test: Perform hydrostatic test. Repair leaks and retest until no leaks exist.

3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion, if necessary.

4. Controls and Safeties: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.

b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

D. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

E. Performance Tests

The water heater manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three separate curves at various BTU input levels. If these curves are not available, it is the responsibility of the water heater manufacturer to complete the following performance tests:

1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.

2. Water heaters shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.

3. Perform field performance tests to determine capacity and efficiency of water heaters.

   a. Test for full capacity.

   b. Test for water heater efficiency at [low fire, 20, 40, 60, 80, 100, 80, 60, 40 and 20] percent of full capacity. Determine efficiency at each test point.

4. Repeat tests until results comply with requirements indicated.

5. Provide analysis equipment required to determine performance.

6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.

7. Notify Architect in advance of test dates.

8. Document test results in a report and submit to Architect.

END OF SECTION 221320

SECTION 221330
PLUMBING FIXTURES AND TRIMS

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

1.2 SCOPE OF WORK

A. The Work of this Contract includes providing all labor, materials, accessories, services and tests necessary to install complete and make ready for operation by the Owner, all work as shown on Drawings and as specified hereinafter.

1.3 QUALITY ASSURANCE

A. All fixture trimmings, including faucets, strainers, escutcheons, shower heads and arms, water closet supplies, stops, waste traps, visible hangers or chair carrier nuts shall be made of brass and shall be polished chromium plated. All material specified, such as chromium plating, shall be thoroughly and evenly applied and guaranteed not to strip or peel. All chromium plating on plumbing fixture trim shall be in accordance with Federal Specification WW-P-541b for grade "R" plating. Manufacturer shall submit certification that all chromium plating on finished trim meets the aforementioned Federal Specification. All plated work shall be highly buffed. Plastic, zinc or white metal will not be acceptable.

B. All fixtures shall be free from imperfections, true as to line, angles, curves and color, smooth, watertight, nameplate in every respect and practically noiseless in operation. Fixtures as specified are given as a typical standard and they or other approved fixtures shall be furnished, set and connected in a good, substantial, neat and workmanlike manner.

C. All fixtures specified to be vitreous ware shall be fixed vitreous china ware of the best quality, non-absorbent and burned so that the whole mass is thoroughly fused and vitrified, producing a material white in color which, when fractured, will show a homogenous mass, close grained and free from pores. The glazing and vitreous china fixtures shall be white, thoroughly fused and united to the body, without discoloration, chips, or flaws, and shall be free from craze. Warped or otherwise imperfect fixtures will not be acceptable.

D. Each supply fixture, casework fixture and equipment, shall be separately controlled by its own stops. Locate as required on wall, above floor or as directed.

E. All faucets shall have metal handles.

F. All trim shall be permanently stamped with manufacturer's identification and visible after installation.

PART 2 PRODUCTS

2.1 PLUMBING FIXTURES

A. DRINKING FOUNTAIN (DF)

1. Elkay EZ BI-LEVEL Unit shall include electric water cooler with bottle filling station. EZSTL8WS shall deliver 8 GPH of 50°F drinking water at 90°F ambient and 80°F inlet water. Cooler units shall have pushbar activation. Bottle filling unit shall include an electronic sensor for touchless activation with auto 20-second shut-off timer. Shall include Green Ticker™ displaying count of plastic bottles saved from waste. Bottle filler shall provide 1.1-1.5 gpm flow rate with laminar flow to minimize splashing. Shall include integrated silver ion anti-microbial protection in key areas. Unit shall meet ADA guidelines. Unit shall be lead-free design which is certified to NSF/ANSI 61 and 372 and meets Federal and State low-lead requirements. Unit shall be certified to UL399 and CAN/CSA 22.2 No. 120. Provide wall carrier Z1225 or equal.

B. LAVATORY COUNTER MOUNTED (L1)

1. Sink integral solid polyme sink & counter.

2. Chicago Faucets No. 797-665ABCP with aerator 797-203878AB, Sink Faucet for hot and cold water, metering, deck-mounted with 4" fixed centers, chrome plated. Includes pop-up waste. Integral, cast brass spout, 4" center-to-center. 1.0 GPM pressure compensating Softflo aerator. 1-3/4" metal, vandal-proof, push handles with blue and red index buttons. MVP self-closing, auto-timed metering cartridge, adjustable run time from 2 to 15 seconds, opens with push, 0.20 max gallon/cycle. 1/2" NPSM supply inlets and coupling nut for 3/8" or 1/2" flexible riser. ECAST® construction with less than 0.25% lead content by weighted average. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, and Certified to NSF/ANSI 61, Section 9 by CSA. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, and Certified to NSF/ANSI 61, Section 9 by CSA.

C. LAVATORY WALL HUNG (L2)

1. Zurn Z5364 20" x 18" vitreous china wall hung lavatory with 4" center faucet holes. Provided with hanger plate and holes for concealed arm carrier systems. 20" [508 mm] x 18" [457 mm], Vitreous china, 4" high back splash, Front overflow, Waste: 1-1/4" O.D. Depth: 5-3/4" Shipping weight: 42 lbs. Provide wall carrier Z1231-EZ series or equal.

2. Chicago Faucets No. 802-VE64-665ABCP, Sink Faucet for hot and cold water, metering, deck-mounted with 4" fixed centers, chrome plated. Integral, cast brass spout, 4" center-to-center. 1.0 GPM pressure compensating vandal-proof Softflo aerator. 1-3/4" metal, vandal-proof, push handles with blue and red index buttons. MVP self-closing, auto-timed metering cartridge, adjustable run time from 2 to 15 seconds, opens with push, 0.20 max gallon/cycle. 1/2" NPSM supply inlets and coupling nut for 3/8" or 1/2" flexible riser. ECAST® construction with less than 0.25% lead content by weighted average. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified to NSF/ANSI 61, Section 9 by CSA, California Health and Safety

Code 116875 (AB1953-2006), Vermont Bill S.152, and NSF/ANSI 372 Low Lead Content. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified to NSF/ANSI 61, Section 9 by CSA, California Health and Safety Code 116875 (AB1953-2006), Vermont Bill S.152, and NSF/ANSI 372 Low Lead Content.

D. SINK (SK)

1. Elkay Lustertone Stainless Steel 22" x 19-1/2" x 6-1/2" Single Bowl Top Mount ADA Sink Model(s) LRAD221965, 3 hole Gourmet (for 8" on center faucet) Elkay Lustertone™ Stainless Steel 22" x 19-1/2" x 6-1/2", Single Bowl Top Mount ADA Sink. Sink is manufactured from 18 gauge 304 Stainless Steel with a Lustertone finish, Rear Center drain placement, and Bottom only pads.

2. Elkay Deluxe 3-1/2" Drain Type 304 Stainless Steel Body Strainer Basket Rubber Seal and Tailpiece Model(s) LK99, Elkay Deluxe 3-1/2" Drain Type 304 Stainless Steel Body, Strainer Basket Rubber Seal and Tailpiece. Overall dimensions are 4-7/16" x 4-7/16" x 7-9/16". Made of Stainless Steel.

3. Zurn AquaSpec® Z871C4-XL-3F Polished chrome-plated 8" [203mm] brass deck faucet with an 8" [203mm] centerline rigid or swing gooseneck spout and quarter turn ceramic disc cartridges. Unit is furnished with a 0.5 GPM pressure compensating aerator (complying with ANSI A112.18.1 Standard for flow), 4" [102mm] vandal resistant color-coded metal wrist blade handles, mounting hardware and 1/2" NPSM coupling nuts for standard lavatory risers. Zurn Lead Free products (-XL), is the line of durable, high quality brass faucets and fixtures that are designed and manufactured to comply with state laws and local codes that mandate lead content levels. Zurn Lead Free products (-XL) are manufactured with less than one quarter of one percent (0.25%) total lead content by weighted

E. LAUNDRY SINK (LS)

1. FIAT #FLTD II double sink *floor mounted serv-a-sink® is furnished with and supported by white baked enamel steel angle legs that slip into molded retainers and/or sockets for rigid friction fit. legs are supplied with leveling devices. has overall outside dimensions of 40" x 24" x 137/8" (1016 x 610 x 352), and inside dimensions (each compartment) of 19" x 187/8" x 121/2" (483 x 479 x 318).*

2. Engineering Specifications: Zurn AquaSpec® Z812J4-XL-3F Polished chrome plated cast brass faucet body with integral shanks, quarter turn ceramic disc cartridges and a 9-1/2"[241mm] tubular brass swing spout. Unit is furnished with a 0.5 GPM pressure compensating aerator (complying with ANSI A112.18.1 Standard for flow), 4" [102mm] vandal-resistant color-coded metal wrist blade handles, mounting hardware and 1/2" NPSM coupling nuts for standard lavatory risers.

F. MOP SINK (MS)

1. Stern William Model No. HL-1800 Size 24"X24"X12", as manufactured by Stern-Williams Co., Inc. Shoulders shall not be less than 9-3/4" high inside measurement, and not less than 1-1/4" wide. All models have 6" drop at threshold. Drain shall be cast brass with stainless steel strainer cast integral and shall provide for a caulked lead connection not less than 1" deep to a 3" pipe. Receptor composed of pearl gray marble chips and white Portland cement ground smooth, grouted and sealed

to resist stains. Stainless steel cap of one piece 20 ga. 302 stainless steel cast integral on threshold.

2. American Standard yoke wall mounted faucet #8354.112 Exposed Yoke Wall-Mount Utility Faucet Top brace. 6" cast brass spout with vacuum breaker. Ceramic disc valves. Integral supply stops. Offset shanks with integral check valves. Vandal-resistant metal lever handles. Bucket hook. 3/4" threaded hose end. 1/2" NPT female inlets. Adjustable centers-to-centers: 6"-10" (152mm - 254mm). Cast brass body. Metal lever handles with hot and cold indicators and vandal-resistant screws. 1/4 turn ceramic disc valve cartridges. Vacuum breaker prevents back flow. Integral service stops. Offset shanks with integral check valves to prevent cross-flow. Spout, top braced to wall, with bucket hook and threaded hose end. 1/2" female inlets with adjustable centers from 6" to 10" (152mm - 254mm).

G. SHOWER (SH1)

1. Oasis Model SH-3232: 32” x 32”, one-piece gelcoated fiberglass shower stall with a 4” low profile dam (1” drain clearance), dual accessory towers, wall surround, and center drain.

   - One - Piece Fiberglass Composite Construction
   - Sanitary Grade Polyester Gelcoat Surface
   - 3-3/8” Dia. Center Drain (see reverse side for location)
   - Twin, Elevated Corner Accessory Towers
   - Textured Floor Pattern
   - Balsa Wood Core Floor Structure
   - Optional ABF Model (provides 3-inches of drain clearance)

2. ZURN Z7301-SS-MT-S9 Single handle pressure balancing mixing shower unit, ceramic control cartridge with stainless steel balancing piston, built in reverse connection capability (To reverse the hot and cold inlets simply remove cartridge and turn 180o), two service stops / check stops, and adjustable limit stop. When valve is turned on it must rotate from cold through to the hot position. All exposed trim and handle are metal with polished nickel chrome plated surface. The valve is supplied with the -S9, 1.5 gpm shower head, arm and flange in chrome plated finish. The valve body is a four port valve with a tub port plug included for shower only applications. The valve inlets, shower and tub outlet are all standard with 1/2" NPT female thread connections. The 1/2" copper sweat options must be specified as shown below.

3. ZURN Z451 Shallow trap floor and shower drain, Dura-Coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with seepage slots, adjustable "TYPE B" polished, nickel bronze heel-proof strainer and cast iron shallow trap body with 2 or 3 [51 or 76] waterway and threaded side outlet.

H. SHOWER (SH2)

1. Oasis Model SH-3636: 36” x 36”, one-piece gelcoated fiberglass shower stall with a 4” low profile dam (1” drain clearance), dual upper shelves and lower accessory ledge, wall surround, and center drain.

- One - Piece Fiberglass Composite Construction
- Sanitary Grade Polyester Gelcoat Surface
- 3-3/8” Dia. Center Drain (see reverse side for location)
- Elevated Back Wall Shelves
- Flat Wall Design To Accommodate Grab Bar Applications
- Low Profile Dam (standard)
- Textured Floor Pattern
- Balsa Wood Core Floor Structure
- Optional ABF Model (provides 3 Inches of drain clearance)
- Factory Applied Reinforcement Packages Available
- Factory Applied Bar Packages Available

2. ZURN Z7301-SS-MT-S9 Single handle pressure balancing mixing shower unit, ceramic control cartridge with stainless steel balancing piston, built in reverse connection capability (To reverse the hot and cold inlets simply remove cartridge and turn 180o), two service stops / check stops, and adjustable limit stop. When valve is turned on it must rotate from cold through to the hot position. All exposed trim and handle are metal with polished nickel chrome plated surface. The valve is supplied with the -S9, 1.5 gpm shower head, arm and flange in chrome plated finish. The valve body is a four port valve with a tub port plug included for shower only applications. The valve inlets, shower and tub outlet are all standard with 1/2" NPT female thread connections. The 1/2" copper sweat options must be specified as shown below.

3. ZURN Z451 Shallow trap floor and shower drain, Dura-Coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with seepage slots, adjustable "TYPE B" polished, nickel bronze heel-proof strainer and cast iron shallow trap body with 2 or 3 [51 or 76] waterway and threaded side outlet.

I. SHOWER (SH3)

1. Oasis Model SHWF-3837: 38” x 37” (36” x 36” interior dimension), one-piece gelcoated fiberglass, flat-wall shower stall with 1/2-inch high maximum finished threshold, floor attachment flange, wall surround, and center drain. Flat wall design allows for the installation of grab bars and seat.

   - One - Piece Fiberglass Composite Construction
   - Sanitary Grade Polyester Gelcoat Surface
   - 3-3/8” Dia. Center Drain (see reverse side for location)
   - 1/2” Threshold To Aid In Keeping Water Within Confines of Unit
   - Contoured Threshold To Aid Entry And Exit
   - 1” Floor Flange To Secure Unit Along Threshold
   - Textured Floor Pattern
   - Factory Applied Reinforcement Packages Available
   - Factory Applied Bar Configurations Available
   - Factory Applied ADA & ANSI Compliant Bar & Seat Packages Available

2. ZURN Z7301-SS-MT-DV-2P-HW-H9-S9 Single handle pressure balancing mixing shower unit, ceramic control cartridge with stainless steel balancing piston, built in reverse connection capability (To reverse the hot and cold inlets simply remove cartridge and turn 180o), two service stops / check stops, and adjustable limit stop. When valve is turned on it must rotate from cold through to the hot position. All exposed

trim and handle are metal with polished nickel chrome plated surface. The valve is supplied with a two-way brass diverter valve, 1.6 GPM adjustable spray hand/wall showerhead in chrome finish, 60" flexible metal hose, 24" mounting slide bar wall connection, (ABS plastic) 1.5 GPM shower head, arm and flange in chrome plated finish. The valve body is a four port valve with a tub port plug included for shower only applications. The valve inlets, shower and tub outlet are all standard with 1/2" NPT female thread connections. The 1/2" copper sweat options must be specified as shown below.

3. ZURN Z7000-QD Quick Dis-Connect is designed to work with the ZURN Handshower/Handwall Shower Hose. The body is manufactured in brass w/hard chrome finish. The inlet and outlet are supplied 1/2-14NPSH threads. Turn over hose and quick disconnect to college in manufactures original packaging.

4. ZURN Z451 Shallow trap floor and shower drain, Dura-Coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with seepage slots, adjustable "TYPE B" polished, nickel bronze heel-proof strainer and cast iron shallow trap body with 2 or 3 [51 or 76] waterway and threaded side outlet.

J. 2 COMPARTMENT KITCHEN SINK (KS)

1. ELKAY #LRAD292265 3 hole Gourmet (for 8” on center faucet) (Lustertone®) Stainless Steel Double Bowl Top Mount Sink. Overall dimensions are 29" x 22" x 6-1/2". Sink is manufactured from 18 gauge 304 Stainless Steel with a Lustrous Highlighted Satin finish, Rear Center drain placement and Full spray sides and bottom. This sink is compliant to ADA and ANSI/ICC A117.1 accessibility requirements when installed according to the requirements outlined in these standards.

2. Zurn AquaSpec® Z871C4-XL-3F Polished chrome-plated 8" [203mm] brass deck faucet with an 8" [203mm] centerline rigid or swing gooseneck spout and quarter turn ceramic disc cartridges. Unit is furnished with a 0.5 GPM pressure compensating aerator (complying with ANSI A112.18.1 Standard for flow), 4" [102mm] vandal resistant color-coded metal wrist blade handles, mounting hardware and 1/2" NPSM coupling nuts for standard lavatory risers. Zurn Lead Free products (-XL), is the line of durable, high quality brass faucets and fixtures that are designed and manufactured to comply with state laws and local codes that mandate lead content levels. Zurn Lead Free products (-XL) are manufactured with less than one quarter of one percent (0.25%) total lead content by weighted average.

K. WATER CLOSET (WC1, WC2)

1. Zurn Z5615-BWL Zurn High Efficiency Toilets and paired performance flush valve systems are designed to exceed industry standards, while using as little as 1.1 gallons of water per flush. Universal high efficiency toilet can be specified with 1.1 gpf [4.2Lpf], 1.28 gpf [4.8Lpf], 1.6 gpf [6.0 Lpf] or dual flush valves. Vitreous china Elongated front rim 2-1/8" fully glazed trapway High efficiency siphon jet flush action Shipping Weight: 40 lbs. System MaP score of 1,000 grams at 1.28 gpf with Zurn Flush Valve Static weight load of 1,000 lbs. Provide wall carrier Z1202 series EZCarry 500 lbs load rated high efficiency carrier or equal. When required provide back to back wall carriers Z1202-ND or equal.

2. SLOAN manual WES 111-1.6/1.1(Code number 3720000) 1.6/1.1 gpf, Polished Chrome Finish, Dual Flush, UPPERCUT® Exposed Manual Flushometer. Flush Valve handle to be green. Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi- Red Brass. Valve shall be in compliance with the applicable sections of ASSE 1037 and ANSI/ASME 112.19.2. Lifting Handle UP initiates reduced flush (1.1 gpf), eliminating liquid and paper waste, saving a 1/2-gallon of water Pushing Handle DOWN initiates full flush (1.6 gpf), eliminating all waste reduces water volume by up to 30% when activated UPWARDS PERMEX® Synthetic Rubber Diaphragm with Dual Filtered Fixed Bypass ADA Metal Non-Hold-Open Handle with Triple Seal Handle Packing Sweat Solder Adapter with Cover Tube & Cast Wall Flange with Set screw Non-Hold-Open Handle, Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation Diaphragm, Handle Packing and Vacuum Breaker to be molded from PERMEX® Rubber Compound for Chloramine Resistance Includes two (2) adhesive backed Metal Wall Plates etched with Instructions

L. WASHING MACHINE BOX (WM)

1. WB200HA Guy Gray metal WMOB with single lever solder valve with hammer arrester Furnish and install Guy Gray galvanized metal washing machine outlet box with provided single lever valve and hammer arresters. Drain option is right hand. Unit shall be product code WB200HA as manufactured by IPS Corporation in Collierville, TN.

M. Traps and Wall Supplies for Plumbing Fixtures

1. MgGuire No. H2167, ½" flexible wall supplies with wheel handle angle stops and ½" I.P.S. nipple to wall and escutcheon.

2. MgGuire No. 201, 1-1/4" x 1-1/2", MgGuire No. 202, 1-1/2 x 1-1/2", cast brass “P” trap with cleanout and No. 2127, 1-½" trap nipple and escutcheon.

3. MgGuire No. 204, 1-1/2" x 2", MgGuire No. 205, 2” x 2" cast brass “P” trap with cleanout and No. 3127, 2" trap nipple and escutcheon

4. Handicapped lavatories shall be set so as to provide 26 inches clearance between the fixture bottom and floor for a depth of 10 inches, and the piping beneath the fixture shall be located so as to prevent injury to persons in wheelchairs. Lavatory installation shall be ADA compliant.

PART 3 EXECUTION

3.1 SERVICES TO FIXTURES AND EQUIPMENT FURNISHED UNDER OTHER SECTIONS

A. The list of equipment for the project shall be reviewed by this Contractor, who shall include in the Contract price the costs for installing all equipment as herein specified and as claimed by the Trade Unions as Plumbing Work.

B. Refer to Architectural and Plumbing Drawings for exact locations of equipment and fixtures. Provide all materials, equipment and appliances necessary and required to complete the installation, including but not limited to the following: plumbing, roughing and final connections, valves, stops, trim, escutcheons, fittings, traps, etc. Install faucets, trim, etc., furnished with the equipment provided by others.

C. Unless otherwise detailed on Drawings, roughing of proper size and capacity for equipment indicated on Architectural, Heating and Ventilation, Plumbing or Electrical Drawings or provided under another Division or Section shall be provided and installed in such a manner and location that final connection can be made with a minimum of work and without cutting, patching permanent walls, partitions, ceilings or floors. Drawings are of necessity, schematic, for special equipment as exact roughing and requirements may vary with different manufacturers.

3.2 INSTALLATION REQUIREMENTS

A. The Contractor shall make all plumbing connections to all equipment and fixtures requiring such connections as shown on Drawings whether the equipment and fixtures are furnished under this Section or another Division or Section. Investigate the equipment furnished under other Divisions or Sections to determine if combination fittings have a means of shut-off or require the installation of check valves, backflow preventors and/or pressure reducing valves. Make final connections to such, including installations of all special traps, supplies, control valves, etc. furnished with such equipment, and furnish all material necessary that is not supplied with the equipment.

B. The Contractor shall leave valved water connection for equipment, spaces and other locations where shown for the use of other trades or other Sections. On each valved outlet for equipment with submerged inlets, provide a backflow preventor after the shut-off valve. Funnel drains and/or floor drains for the air conditioning, heating and refrigeration work shall be provided.

C. Fixture supplies and traps as specified, shall be chrome plated brass where exposed to view. Where concealed from view in cabinets, etc., they may be rough brass. All fixture supplies shall have stops.

D. As soon as installed, all metal fixture trimming shall be thoroughly covered by this Contractor with non-corrosive grease which shall be maintained until all construction work is completed.

E. Upon the completion of the Work, all fixtures and trimmings shall be thoroughly cleaned and polished and free from all marks and left in first-class condition.

F. Upon completion of the Work, test flush valves and faucets for leaks or drips and adjust same for quiet operation.

G. All fixtures shall be left thoroughly clean. All plated or polished fittings, pipes and appliances shall be coated with Vaseline immediately after installation, and shall be finely polished and free from all marks and foreign substances.

H. Equipment and all connections shall be in accordance with the rules relative to submerged inlets and shall be provided with all necessary vacuum breakers and check valves in accordance with the applicable codes.

I. Connection between any fixture with a floor outlet and flange shall be made with an approved prepared gasket that shall be a germicide, absolutely gas and fume-proof, watertight, stain-proof, containing neither oil nor asphaltum, and which will not rot, harden or dry under any extreme climate change and must adhere on wet surfaces.

J. Each fixture shall be separately trapped, using the type and size of trap called for specifically in the Specifications or the type required by the Plumbing Code. The traps shall be approved type.

K. All fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of fixture.

L. The Contractor shall be responsible for protecting all plumbing fixtures, equipment, etc., provided under Plumbing Work Sections against injury from building materials, acids, tools and equipment.

M. No slip joints will be permitted on water piping.

N. Double compartment sinks or lavatories shall be provided with faucet, trap, supplies, etc. for each compartment.

O. All joints where fixtures come in contact with walls or floors shall be sealed.

END OF SECTION 221330

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SECTION 224000
APPROVED MANUFACTURERS FOR PLUMBING WORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section coordinates with and is complementary to Division 1 and Supplementary General Conditions, wherever applicable to Mechanical and Electrical Systems Work.

B. Section 220100 - General Provisions for Plumbing Work shall apply.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

A. The manufacturers' names and models hereinafter specified represent a standard of materials, appearance, finishes, performance, etc.

B. The Contractor has the option of submitting other manufacturers for approval in lieu of the manufacturers hereafter specified, provided their respective products conform in all respects to the manufacturers hereafter specified.

C. The following is a list of approved manufacturers:

1. Plumbing Fixtures (Vitreous China) (L1, L2, WC-1, WC-2, WC-3)
    a. American Standard
    b. Kohler
    c. Zurn
    d. Crane
    e. Niagara
2. Gauges and Thermometers
    a. U.S. Gauge Co.
    b. Ashton
    c. Ashcroft
    d. Philadelphia Thermometer Co.
    e. Mueller
    f. Taylor

3. Shower Mixing Valves (SH-1, SH-2, SH-3)

    a. American Standard

    b. Powers

    c. Speakman

4. Trim for Plumbing Fixtures and Hose Bibbs (all plumbing fixture scheduled items except (WM)

    a. Niagara

    b. Kohler

    c. Chicago Faucet

    d. T&S Brass

    e. American Standard

    f. Zurn

5. Hangers and Supports

    a. Carpenter & Paterson, Inc.

    b. Fee and Mason

    c. Grinnell

6. Escutcheons

    a. Fee and Mason Mfg. Co.

    b. Ritter Pattern and Casting Co.

7. Insulation

    a. Owens-Corning Fiberglass Co.

    b. Gustin-Bacon Mfg. Co.

    c. Pittsburgh Plate Glass Co.

8. Circulating Pump (HWCP-1)

    a. Thrush

    b. Bell and Gossett Co.

    c. Taco Inc.

    d. Nibco

9. Hot Water Mixing Valves (MV-1)
    a. Armstrong International
    b. Lawler Manufacturing Co. Inc
    c. Powers Process Controls
10. Water Hammer Arrestors
    a. J.R. Smith Co.
    b. Josam Mfg. Co.
    c. Zurn Mfg. Co.
    d. Wade Mfg. Co.
11. Shower Bases and Mop Receptors (MS, SH-1, SH-2, SH-3)
    a. Swan Corp.
    b. Fiat Metal Mfg. Co.
    c. Stern - Williams
12. Heaters (all water heater scheduled items)
    a. Patterson - Kelley Inc.
    b. PVI
    c. A.O. Smith
    d. EcMax
    e. Chronomite
    f. Rheem
    g. Intellihot
    h. Aerco
13. Valves
    a. Walworth Co.
    b. Hammond
    c. Crane Co.
    d. Stockham

14. Electric Water Coolers (DF)
    a. Elkay
    b. Sunroc
    c. Halsey Taylor
15. Flush Valves (WC-1, WC-2, WC-3)
    a. Delaney
    b. Sloan Royal
    c. Zurn
16. Drains, Carriers and Specialties (Lav-2, WC-1, WC-2, WC-3, FD-A, FD-B)
    a. Wade
    b. J.R. Smith
    c. Josam
    d. Zurn
17. Toilet Seats (WC-1, WC-2, WC-3)
    a. Beneke
    b. Church
    c. Olsonite
18. Piping and Fittings (Cast Iron)
    a. American Cast Iron Pipe Co.
    b. Alabama Pipe Co.
    c. Central Foundry Co.
    d. United States Pipe and Foundry
19. Pipe (Steel)
    a. Youngstown Sheet and Tube Co.
    b. Republic Steel Co.
20. Pipe and Fittings (Copper)
    a. Bridgeport Brass
    b. Mueller Brass Co.

c. Anaconda sAmerican Brass Co.

d. Chase Brass and Copper Co.

21. Trap Primers and Splitters (FD-A, FD-B)

a. Sioux Chief

b. J R Smith

c. Wade

END OF SECTION 224000

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SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single phase electric motors.

B. Three phase electric motors.

1.2 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.

B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2004.

C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS

A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

B. Test Reports: Indicate test results verifying nominal efficiency and power factor for motors larger than 1/2 horsepower.

1.4 QUALITY ASSURANCE

A. Conform to NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering.

PART 2 PRODUCTS

2.1 GENERAL CONSTRUCTION AND REQUIREMENTS

A. All motors shall be NEMA Premium efficiency in accordance with NEMA MG 1-2011 and shall be labeled as such.

B. All motors will be inverter duty rated.

C. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 40 degrees C environment.
   3. Design for temperature rise in accordance with NEMA MG 1-2011 limits for insulation class, service factor, and motor enclosure type.

D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

E. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.

2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 230519
METERS AND GAGES FOR HVAC AND BMS CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electric, potable water, high temperature hot water and natural gas meters to be furnished and installed as follows. BMS Contractor shall provide all required wiring, connections and programming to allow for readout of all data through the BMS system.
   1. Electric metering through a Digital Energy Monitor to be provided by BMS Contractor in accordance with Section 230924, paragraph 2.8 N. Electric meter to be furnished by the HVAC subcontractor (Division 23) and turned over to the Electric subcontractor (Division 26). The Electric subcontractor shall install the meter in the switchgear at the electric service entrance. The BMS Contractor shall provide (furnish and install) for the electric meter all required control signal monitoring wiring and output connections to the meter and to the BMS system.
   2. Compound type potable water meter to be furnished by the HVAC subcontractor (Division 23) and turned over to the plumbing subcontractor (Division 22). The plumbing subcontractor shall install the meter in the piping system at the potable water service entrance. The BMS Contractor shall provide (furnish and install) flow rate totalizer and all required wiring and connections to the meter and to the BMS system.
   3. High temperature hot water meter to be furnished by the HVAC subcontractor (Division 23) who shall install the meter sensors surface mounted on the high temperature hot water supply piping entrance to the building where indicated on plans. The BMS Contractor shall provide all required control wiring and connections to the meter and to the BMS system.
   4. Natural gas meter (quantity 1) to be funished by the HVAC subcontractor (Division 23) and turned over to the plumbing subcontractor (Division 22). The plumbing subcontractor (Division 22) shall install the meter in the natural gas piping system at the gas service entrance. The BMS Contractor shall be responsible for wiring, programming and connections to the BMS system.

B. Pressure gages and pressure gage taps for HVAC systems to be provided by the HVAC subcontractor (Division 23).

C. Thermometers and thermometer wells for HVAC systems to be provided by the HVAC subcontractor (Division 23).

1.2 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; 2007.

C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014.

E. AWWA C702 - Cold Water Meters -- Compound Type; American Water Works Association.

F. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; American Water Works Association.

G. NSF/ANSI Standard 61 Lead Free Water Meter Certification.

H. CSA C22.2, UL1604 Listings for Mass Flow Gas Meters.

I. ANSI C12.1 Accuracy Specifcation for Digital Energy Monitor Current Transmitters.

J. SUBMITTALS
   1. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.
   2. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.1 ELECTRIC METERS

A. Digital Energy Monitor to be provided by the BMS Contractor in accordance with Section 230924, paragraph 2.8 N.

B. Output signals: Shall be conpatible with the Siemens BMS control system.

2.2 NATURAL GAS METERS

A. Proprietary Specification
   1. Due to standardization of BMS gas meters the campus has received a proprietary specification exemption for the meter described herein.

B. Sage inline mass flow gas meter, Series SRP 400 with remote electronics, 24VDC, 316 stainless steel wetted components, Class I Div 2 junction box, with totalizer.
   1. Piping flow element: In line style 316 stainless steel 3" dia. x 12" lg. schedule 40 pipe with flanges, to include junction box housing explosion proof class 1 Div 1 & 2 (with no internal electronics). For use with 3" gas piping, see plumbing drawings for meter location required. Do not use pipe reducers in mounting.
   2. Remote electronics unit: with NEMA 4 enclosure dual compartment, with OLED digital display. Unit shall display mass flow rate, totalized flow and temperature, with graphical flow rate bar graph type display. accuracy is +/- 0.5% full scale, +/- 1% of reading with turn down of 100 to 1. Unit shall include 25 ft. 6 conductor compensated cable. Provide 3/4" NPT raceway between JB and remote unit.
   3. Gas load: Meter shall be rated for 3002 MBH gas load at 14" wc. inlet pressure.
   4. Unit model Number: SRP-300-S150FLG-300-DC24-NG.

C. Output signals: Isolated 4 - 20 mA, pulsed output for for totalized flow (24VDC SSTD) and modbus RS-485 RTU. Outputs shall be conpatible with the Siemens BMS control system.

D. Note: (1) Natural gas meter is required, see plumbing drawings for intended location.

2.3 POTABLE WATER METERS

A. Proprietary Specification
   1. Due to standardization of potable water meters the campus has received a proprietary specification exemption for the potable water meter described herein.

B. Badger Recordall Compound Series meter, cast bronze housing with (2) covers, stainless steel trim, ceramic magnets, postive displacement chamber for low flow, turbine disc chamber for high flow. Direct readout for rate and totalizer flow. Provide part no. 31012726240.
   1. Water line size 4"; contractor shall verify size as noted on plumbing drawings.
   2. Meter connections: provide flanged connections to match line size with accessory kit.
   3. Maxium continuous flow rated at 800 gpm, with 11.0 psi drop. Maxium operating pressure 150 psi, at 105 fegrees F.

C. Industrial Registers: Provide Qty (2) Badger ER420-LP meter mounted flow rate totalizer, loop powered, passive transistor output, load maximum 50V DC to 300mA. 7 digit

readout with dispay functions for total and/or flow rate, total and accumulated total, all resettable to zero. Analog output 4-20 mA; and a pulse train output .

1. Register unit shall have digital display with menu driven functions.
2. Output signals: Shall be conpatible with the Siemens BMS control system.

2.4 HIGH TEMPERATURE HOT WATER METERS

A. Configuration:
   1. The meter shall be a strap on type ultrasonic Flow/BTU meter . Manufacturer: Flexim Americas Corp. 250-V Executive Drive Edgewood, NY 11717.
      a. Sensor Type: Non invasive Clamp on flow transducers style.
      b. Fluid: High Temperature Hot Water (400F/400 PSIG operating conditions).
   2. A metal tag (stainless steel) shall be permanently attached to the flow sensor showing Model No., Serial No., Pipe I.D., Tag No., Max Pressure & Temperature, Max D/P, Max Allowable Insertion D/P and Flow Coefficient.

B. Materials:
   1. Transmitter: Model 7407, single channel energy meter, NEMA 4X enclosure with LCD display & keypad. Communications shall be to BACnet-IP. Furnish with all brackets & mounting hardare. Mount transducer on wall immediately adjacent to sensor components.
   2. Sensor elements are intended to be installed on supply pipe in a vertical flow upward direction.
   3. Flow Transducers: Dual path sensor head (with (2) flow transducers) configuration for measurement of HTHW in a 4" steel pipe. Strap on mounting with both transducer heads. Furnish with factory coupling pads and 13 Ft. long armored cables. Measurable flow velocity: 0.03 to 115 ft/sec.
   4. Temperature Sensors: Supply and Return pipe clamp on type sensors with high temperature mounting, clamp on stainless steel straps. Sensors rated for use on -40 to 392 deg. F. using 1000 ohm RTD's with +/- 0.03 deg F accuracry, provide 20 Ft. long sensor cable.
   5. Factory certification: The factory will wet test and certify meter to NIST standards. The certification data will be loaded to an 'sensprom', this chip shall be installed in the meter installed for the project to insure compliance with meter performance in compliance with certification standards.
   6. Insulation: Install all meter elements, start up and perform configuration and testing. After start up is complete, completely insulate over all sensor elements with standard pipe insulation.

C. Accuracy:
   1. The accuracy of the flow element shall be within 1% od reading +/-0.01 m/s of actual flow ratre with a minimum resolution of 0.03 ft/sec.
   2. The installation of the meter shall require 5 diameters up stream and 2 diameters downstream straight Run to achieve the specified accuracy, regardless of the upstream piping configuration. Flow in upward direction is preferred.
   3. Certified test data from independent flow laboratories shall be provided as verification.
   4. The repeatability of the flow element shall be 0.15% of reading +/- 0.01 m/s.

D. Factory Authorized Commissioning and Optiumization:
   1. After meter installation, Include in bid cost, time for a factory authorized technicion to start up meter system. Start up shall include commissioning, loading all software, performing diagnostic flow test and verification procedures.

E. Electronics:
   1. Meter power shall be 120 VAC.

2. Flow meters shall provide a BACnet-IP communications output to the BMS system.

2.5 PRESSURE GAGES

A. Manufacturers:
   1. Dwyer Instruments, Inc
   2. Moeller Instrument Co., Inc
   3. Weiss Instruments

B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: Two percent.
   4. Scale: Psi.

2.6 PRESSURE GAGE TAPPINGS

A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

B. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

2.7 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Dwyer Instruments, Inc
   2. Omega Engineering, Inc
   3. Weiss Instruments

B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane. For use in low temperature hot water systems only.
   1. Size: 9 inch scale.
   2. Window: Clear glass.
   3. Accuracy: 2 percent, per ASTM E77.
   4. Calibration: Degrees F.

2.8 DIAL THERMOMETERS

A. Manufacturers:
   1. Dwyer Instruments, Inc
   2. Omega Engineering, Inc
   3. Weiss Instruments

B. Thermometer: ASTM E1, stainless steel case, adjustable angle with front recalibration, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem. Range 50-550 degrees F unless noted otherwise. For use in high temperature hot water systems.
   1. Size: 3 inch diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

2.9 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all equipment in accordance with manufacturer's instructions.

B. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Extend nipples and siphons to allow clearance from insulation.

C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

D. Electric, potable water, high temperature hot water and natural gas meters to be furnished and installed as follows. The BMS Contractor shall provide all required wiring, connections and programming to allow for readout of all data through the BMS system.

1. Electric metering through a Digital Energy Monitor to be provided by the BMS Contractor in accordance with Section 230924, paragraph 2.8 N. Meter equipment shall be installed by the electric contractor. The BMS Contractor shall provide all required wiring between the connections to the meter and to the BMS system.
2. Compound type potable water meter to be furnished by the HVAC subcontractor (Division 23) and turned over to the plumbing subcontractor (Division 22). The plumbing subcontractor shall install the meter in the piping system at the potable water service entrance. The BMS Contractor shall provide (furnish and install) flow rate totalizer and all required wiring and connections to the meter and to the BMS system.
3. High temperature hot water meter to be furnished by the HVAC subcontractor (Division 23) who shall install the meter in the high temperature hot water supply piping entrance to the building where indicated on plans. The BMS Contractor shall provide all required wiring between the connections to the meter and to the BMS system.
4. Natural gas meter (Quantity 1 required); to be funished by the HVAC subcontractor (Division 23) and turned over to the plumbing subcontractor (Division 22). The plumbing subcontractor (Division 22) shall install the meter in the natural gas piping system at the gas service entrance. The BMS Contractor shall be responsible for wiring, programming and connections to the BMS system.

E. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

F. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

END OF SECTION

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

1.3 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Automatic Controls: Tags. Key to control schematic.

C. Control Panels: Nameplates.

D. Dampers: Ceiling tacks, where located above lay-in ceiling.

E. Ductwork: Nameplates.

F. Heat Transfer Equipment: Nameplates.

G. Instrumentation: Tags.

H. Major Control Components: Nameplates.

I. Piping: Tags.

J. Pumps: Nameplates.

K. Small-sized Equipment: Tags.

L. Tanks: Nameplates.

M. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

C. Substitutions: See Section 016000 - Product Requirements.

2.3 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.

2.4 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.5 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.
   3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify air handling units, pumps, heat transfer equipment and tanks devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify valves in main and branch piping with tags.

H. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

I. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

J. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

C. Measurement of final operating condition of HVAC systems.

1.2 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; 2005, Seventh Edition.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.3 SUBMITTALS

A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Procedures for formal deficiency reports, including scope, frequency and distribution.

B. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC MN-1, AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire, smoke and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place.
   15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect and Engineer to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes (belts and sheeves) required. Vary branch air quantities by damper regulation.

G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

J. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.7 SPECIAL ENERGY RECOVERY UNIT AIR TESTING PROCEDURES (ERU1 & ERU2)

A. These units operate in multiple modes and require special testing and reporting for the below listed operating conditions. Also refer to the control operating sequences, see specification section 230993 for reference.

B. Note: The different operating modes, fan speeds, and damper positions, will change resulting system pressure drop conditions and will require multiple testing and balance for each air flow condition. Provide separate balance reports for each operating condition as listed below.

C. The TAB sub contract shall provide the speed setpoint conditions to the building automation sub contract for their use in setting up the multiple mode VSD setpoints.

D. Operating Modes:
1. Occupied normal mode; OA 100% speed, EA 100% speed.
2. Occupied Set back mode; OA 50% speed, ES 50% speed.
3. Occupied Bypass/ Economizer mode; unit operates with wheel bypass dampers open, OA 100% speed, EA 100% speed.
4. Occupied Exhaust only mode; OA 0%, EA 100%.

3.8 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.9 PIPING TESTS:

A. Water Piping Systems: After installations are complete and before insulation is applied, test all piping as described herein. Maintain test pressures as long as required to determine tightness of system and to inspect joints visually. Wherever testing indicates leaks, repair such leaks and re-test until system is proven tight. Attachments such as gauges, pilot devices, regulating valves, etc. that could be damaged by testing pressures shall be removed or isolated from system being tested. Test pressures shall be as follows:
1. Hot water heating piping, hydrostatically at 150 psi.

2. Drain piping, hydrostatically at 25 psi.
3. High temperature hot water piping, hydrostatically at 600 psi.

B. Refrigerant Piping Systems: Test each field installed refrigerant piping system in accordance with the Mechanical Code of New York State. Every refrigerant-containing part of each system that is erected under this scope of work shall be tested and proved tight after complete installation and before operation. Tests shall include both the high and the low-pressure sides of each system. Initial test shall be at not less than the design pressure of the system or a minimum of 20psig to verify joint integrity. Final test shall be at not less than the design pressure of the system or the setting of the pressure relief device at full charge.
   1. Exceptions: Compressors, condensers, vessels, evaporators, safety devices, pressure gauges and control mechanisms that are listed and factory tested are not required to be tested under the requirements of 3.3.A above.

C. Test duration shall be a minimum of 15 minutes.

END OF SECTION

SECTION 230713
DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

1.2 RELATED REQUIREMENTS

A. Asbestos and PCBs must be abated completely prior to any task unless demolition is required to access the asbestos or PCBs. If asbestos or suspected hazardous materials are discovered and/or disturbed, cease operations and notify Owner and Owner's Representative immediately.

1.3 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Fiber Glass: .
   2. Johns Manville Corporation:
   3. Owens Corning Corp:
   4. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: 0.27 at 75 degrees F, when compressed 25% and 0.29 at 75 degrees F, when tested in accordance with ASTM C518
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.3 GLASS FIBER, RIGID

A. Manufacturer:
   1. Knauf Fiber Glass:
   2. Johns Manville Corporation:
   3. Owens Corning Corp:
   4. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent.
   4. Maximum Density: 8.0 lb/cu ft.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.4 DUCT LINER

A. Manufacturers:
   1. K-Flex Usa
   2. Armacell

B. Elastomeric, closed cell insulation with a protective skin on one side and pressure sensitive adhisive with reinforced scrim on the other. Liner shall be non-porous, fiber-free and shall include an antimicrobial agent to prevent mold, fungal and bacterial growth.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
   1. Provide with standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Install duct liner per manufactuer's recommendations. Seal all joints and seams exposed to the air stream. Duct surface shall be cleaned and prepped prior to liner installation. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Outside Air Intake Ducts: 4" Rigid Glass Fiber

B. Outside Air Plenums: 4" Rigid Glass Fiber

C. Supply and return ductwork serving Elevator (AC-3): 3" Flexible Glass Fiber

D. Exhaust air ducts and plenums upstream located between shut-off damper and exterior louver: 4" Rigid Glass Fiber.

E. Supply and Return Duct within 20 feet of ERU1 and ERU2 connections: 1" Duct Liner

END OF SECTION

SECTION 230716
HVAC EQUIPMENT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment insulation.

1.2 RELATED REQUIREMENTS

A. Asbestos and PCBs must be abated completely prior to any task unless demolition is required to access the asbestos or PCBs. If asbestos or suspected hazardous materials are discovered and/or disturbed, cease operations and notify Owner and Owner's Representative immediately.

1.3 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

D. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, RIGID

A. Insulation: ASTM C612 or ASTM C592; rigid, noncombustible.
   1. 'K' Value: 0.25 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
   2. Maximum Service Temperature: 850 degrees F.

3. Maximum Water Vapor Absorption: 5.0 percent by weight.
4. Maximum Density: 8.0 lb/cu ft.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
1. Armacell International
2. K-Flex USA LLC
3. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3, in sheet form.
1. Minimum Service Temperature: -40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

F. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.3 SCHEDULE

A. Heating Systems:
1. High Temperature Hot Water Heat Exchangers: 4.5" Glass Fiber
2. Radiant Floor Heat Exchangers: 2" Flexible Cellular
3. Air Separators: 2" Flexible Cellular

END OF SECTION

SECTION 230719
HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED REQUIREMENTS

A. Asbestos and PCBs must be abated completely prior to any task unless demolition is required to access the asbestos or PCBs. If asbestos or suspected hazardous materials are discovered and/or disturbed, cease operations and notify Owner and Owner's Representative immediately.

1.3 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

E. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER

A. Manufacturers:
   1. Knauf Fiber Glass
   2. Johns Manville Corporation
   3. Owens Corning Corp
   4. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.

2. Maximum Service Temperature: 850 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
1. Aeroflex USA, Inc
2. Armacell International
3. K-Flex USA LLC

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3; use molded tubular material wherever possible.
1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Glass fiber insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. Glass fiber insulated pipes conveying fluids above ambient temperature.
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

G. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations unless assembly being penetrated has a fire rating. Finish at supports, protrustions and

interruptions. Provide UL listed penetration assemblies at all penetrations to fire rated assemblies.

I. Provide pipe insulation in finned tube enclosures as detailed on drawings.

3.3 SCHEDULE

A. Heating Systems:
   1. Heating Hot Water Supply and Return Piping:
      a. Piping 1-1/4" and smaller, 1-1/2" Glass Fiber
      b. Piping 1-1/2" and larger, 2" Glass Fiber
   2. High Temperature Hot Water Supply and Return Piping.
      a. Piping 1-1/4" and smaller, 4" Glass Fiber
      b. Piping 1-1/2" and larger, 4.5" Glass Fiber

B. Cooling Systems:
   1. Refrigerant Piping
      a. Piping 2" and smaller: 1" Flexible Elastomeric Cellular
   2. Cooling Coil Condensate Piping
      a. Piping 2" and smaller: 1" Glass Fiber

END OF SECTION

SECTION 230800
COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Abbreviations: The following are common abbreviations used in the Specifications.

A/E -	Architects and Design Engineers	EC -	Electrical Representative
CxA -	Commissioning Authority	FT -	Functional Performance Test
CC -	Controls Representative	CM -	Construction Manager
CTR -	Contractor	MC -	Mechanical Representative
Cx -	Commissioning	PFI -	Pre-Functional Inspection
Cx Plan -	Commissioning Plan Document	PM -	Project Manager (of the owner)
PC -	Plumbing Representative	TAB -	Test and Balance Contractor

1.2 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. The Owner and the CxA reserves the right to amend this list at anytime during the construction and acceptance process.

HVAC

1. Air Compressor
2. Automated Control Systems
3. Ductwork
4. Energy Recovery Units
5. Exhaust and Supply Fans
6. Glycol Feed System
7. Heat Exchangers
8. Heating Coils
9. Hot Water Pumps
10. Hydronic Water Piping, Valves and Accessories
11. Perimeter Radiation and Radiant Floor
12. Split A/C Units
13. Unit Heaters, Cabinet Unit Heaters and Convectors

1.3 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. General specifications for commissioning responsibilities and reporting requirements are provided in the following sections:

Section 019113 – General Commissioning Requirements
Section 240100 – Commissioning Requirements

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FUNCTIONAL TESTING SUPPORT REQUIREMENTS

A. General Requirements
1. This section provides brief descriptions of the testing and support the contractors will be required to provide to perform the functional testing of the equipment for the project.

B. Air Compressor
1. The contractor(s) will be required to demonstrate all safeties (personnel and mechanical), local device operation and any local controls.

C. Automated Control System
1. The BMS contractor will be required to demonstrate that all specified hardware and software has been provided; graphical user interfaces are complete, displaying current data that updates and refreshes within the times listed in the specification; all specified network connections (e.g. to the internet/LAN/WAN) are established; login and system security is set up; utilities for alarming (local and remote), scheduling, reporting, trending, graphic templates/editing capability are programmed and complete.
2. The BMS contractor will be required to verify and certify in writing that all input and out points are operating properly, calibrated and annunciate properly on the BMS. These points will then be verified by the CxA in the presence of the BMS contractor.
3. The BMS contractor will be required to verify and certify in writing that all sequences of operations that were programmed by the BMS contractor are operating as per the design intent. The demonstration of these sequences will be performed at least once by the installing contractor as part of their independent commissioning process and then in the presence of the CxA, as directed by the CxA.
4. All reports, alarms and graphics must be fully completed and certified, in writing by the installing contractor, that these items are completed and have been verified by the installing contractor. This includes, but is not limited to:
   a. All system graphics including BACnet, Lon or ModBus interfaces.
   b. Alarms including setpoints, graphical annunciation, cell phone annunciation, email annunciation, etc.
   c. Trending of any point defined by the CxA.
5. All alarms. Any alarm that is to be annunciated will include the appropriate text describing the alarm. System code or any other code that is not immediately intuitive to the system operator is not acceptable. The owner will not be responsible for programming or developing any text for the annunciation of the alarms on any device. This includes local panels, BMS interface or remote wireless annunciation or notification.
6. The CxA will perform a point-to-point verification of all digital outputs, digital inputs, analog outputs, analog inputs, universal inputs and universal outputs. **The controls representative is required to be present during this testing.**
7. The CxA will test all sequences of operations for selected equipment. **The controls representative is required to be present during this testing.**

D. Ductwork
1. The contractor(s) will be required to demonstrate in writing that leakage testing has been conducted on all ductwork, as specified in the ductwork specifications.
2. The contractor(s) will be required to demonstrate in writing (TAB Report) that all ductwork has been balanced to achieve the specified design flows, as specified in the TAB specifications.

E. Energy Recovery Units
1. The contractor(s) will be required to demonstrate all safeties (personnel and mechanical e.g. over-pressurization and freezestat); local device operation (dampers, variable speed drives, heating coils, heat wheel operation, etc.); any local controls including temperature, heat wheel and fan speed control; and integrated 3rd party Building Management System controls including all related devices and sequence of operations.
2. Any local controls such as energy recovery wheels, variable speed drives or equipment controls will require the representative who was responsible for the programming and setting up of the equipment to document the set points and demonstrate the performance of their equipment.

F. Exhaust and Supply Fans
1. The contractor(s) will be required to demonstrate all safeties (personnel and mechanical e.g. low static pressure); local device operation (dampers, etc.); and any integrated 3rd party Building Management System controls including all related devices and sequences of operation.
2. The controls representative will be required to demonstrate their systems' integrated performance. Any local controls or equipment controls will require the representative who was responsible for the programming and setting up of the equipment to document the set points and demonstrate the performance of their equipment.
3. The manufacturer's representative will be required to verify all electrical circuitry, VSD operation, fan and motor rotation, lubrication, fan belt alignment and condition and to verify that the unit is free from defects, damage, and is fully sealed. In addition any field adjustable switches and circuit breaker ranges should be set. All shipping bolts, blocks or straps should be removed and all required labels should be installed and visible.

G. Glycol Feed System
1. The glycol water make-up systems will be tested and verified for proper makeup operation, pressure regulation, glycol concentration and alarm feedback to the BMS.

H. Heat Exchangers
1. The contractor(s) will be required to demonstrate in writing (TAB Report) that the flow through the heat exchanger is balanced to achieve the specified design flows as required in the TAB specifications.
2. The controls representative will be required to demonstrate that the control valves can modulate to maintain system set point as per the sequence of operations; and any integrated 3rd party Building Management System controls including all related devices and sequences of operation. In addition, a representative will be required to manually operate all hand valves.

I. Heating Coils

1. The contractor(s) and the manufacturer's representative will be required to demonstrate that all coils are installed proper, proper trim (including all vents and circuit setters) and are free of leaks and defects.

J. Hydronic Pumps

1. The contractor(s) and the manufacturer's representative will be required to demonstrate that all pumps are properly aligned, the pumps operate in the proper direction and that the overload protective devices are installed properly and set to the proper settings.
2. The contractor(s) will be required to demonstrate in writing (TAB Report) that the pumps are balanced to achieve the specified design flows, including motor performance data as specified in the TAB specifications.
3. The controls representative will be required to demonstrate that the pumps can start, stop, modulate speed (if required) and the lead/lag sequence performs as per the sequence of operations. In addition, a representative will be required to manually operate all hand valves.

K. Hydronic Water Piping, Valves and Accessories

1. The contractor(s) will be required to demonstrate in writing that all hydronic water piping has been cleaned and sanitized before the system has been primed.
2. The contractor(s) will be required to demonstrate in writing (TAB Report) that all hydronic water systems have been balanced to achieve the specified design flows, as specified in the TAB specifications.

L. Perimeter Radiation and Radiant Floor

1. The contractor(s) will be required to demonstrate all safeties; local device operation (control valves, heating elements, etc.); and any local controls including temperature control.
2. A representative will be required to manually operate all hand valves, and any local controls will require the representative who was responsible for the programming and setting up of the equipment to document the set points and demonstrate the performance of their equipment.

M. Split Air Conditioning and Condensing Units

1. The contractor(s) will be required to demonstrate all safeties (personnel and mechanical e.g. high pressure, low temperature, etc.); any local controls (refrigerant control valve, etc.), including temperature control; and integrated 3rd party Building Management System controls including all related devices and sequences of operation.
2. The controls representative will be required to demonstrate their systems' integrated performance. Any local controls will require the representative who was responsible for the programming and setting up of the equipment to document the set points and demonstrate the performance of their equipment (startup report). In addition, a representative will be required to manually operate all hand valves.

N. Unit Heaters, Cabinet Unit Heaters, and Convectors

1. The contractor(s) will be required to demonstrate all safeties; local device operation (control valves, heating coil, etc.); any local controls including temperature and fan control; and integrated 3rd party Building Management System controls including all related devices and sequences of operation.

2. A representative will be required to manually operate all hand valves, and the controls contractor will be required to demonstrate their systems' integrated performance. Any local controls will require the representative who was responsible for the programming and setting up of the equipment to document the set points and demonstrate the performance of their equipment.

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SECTION 230924
DIRECT - DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1. WORK INCLUDED:

A. Proprietary Specification Exemption
   1. Due to the presence of an existing campus wide Building Management System (BMS) that is already in use throughout all other portions of the campus, the campus has requested and received a proprietary specification exemption for the BMS system.
   2. All portions of the BMS system as described herein and as required to provide a complete operatonal control system, including, but not limited to, all hardware, software, programming and training shall be as manufactured and installed by Siemens USA, referred to herein as the BMS Contractor.

B. General - Building Management System (BMS) Contractor shall provide and install:
   1. A fully integrated Building Automation System (BAS), incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems with open communications capabilities as herein specified.
   2. Complete temperature control system to be DDC with electric and pneumatic actuation as specified herein.
   3. All wiring, conduit, panels, and accessories for a complete operational system.
   4. Provide communication with existing Apogee system.
   5. Provide system graphics for each controlled device and/or integrated systems as required by the owner. Origin of information shall be transparent to the operator and shall be controlled, displayed, trended, etc. as if the points were hardwired to the BMS.
   6. Coordinate IT addresses with SUNY Campus Telecommunications Department contact:
      Jay Palen - SUNY IT
      Email: palenj@newpaltz.edu
      Phone: 845-257-3993
      Fax: 845-257-3009

C. General product description
   1. The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation, or identification number and sequence of operation all bearing the name of the manufacturer. The installing manufacturer shall certify in writing, that the shop drawings have been prepared by the equipment manufacturer and that the equipment manufacturer has supervised their installation. In addition, the equipment manufacturer shall certify, in writing, that the shop drawings were prepared by their company and that all temperature control equipment was installed under their direct supervision
   2. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed specially for

this project. All systems and components shall have been thoroughly tested and proven in actual use for at least two years.

3. The system shall be scalable in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, and operator devices.
4. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.
5. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC Controllers shall also be able to send alarm reports to multiple operator workstations without dependence upon a central or intermediate processing device.
6. DDC Controllers shall be able to assign password access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust or control only the points that the operator is authorized for. All other points shall not be displayed at the PC workstation or portable terminal. (e.g. all base building and all tenant points shall be accessible to any base building operators, but only certain base building and tenant points shall be accessible to tenant building operators). Passwords and priority levels for every point shall be fully programmable and adjustable.

1.2. PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Hydronic Piping:
   1. Control Valves
   2. Temperature Sensor Wells and Sockets
   3. Flow Switches
   4. Pressure Transmitters
   5. Differential Pressure Transmitters

B. Ductwork Accessories:
   1. Dampers
   2. Air-flow Stations

1.3. RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents.

B. It is the responsibility of this contractor to review all sections of the contract documents including Division 22, 23, 24, 26 and 28.

C. The contractor shall refer to specification section GENERAL COMMISSIONING REQUIREMENTS for additional activities and requirements to support the system commissioning process.

1.4. CONTROL SYSTEM

A. The following is the Control System Contractor and Manufacturer:
   1. Siemens Building Technologies, Inc. - Product Line: APOGEE System

1.5. OPERATOR INTERFACE SOFTWARE

A. Provide operator interface software with licensing for use on this project using the Desigo software system with the following criteria:
   1. Input Output point capacity: 3000 point capacity.
   2. Simulaaneous users: Quantity (5) user capacity.
   3. Graphics: Provide all graphic interfaces (GUI) for this specific project only, using the Desigo software version.
   4. Server Hardware: The hardware platform will be provided by the SUNY College Campus.

1.6. QUALITY ASSURANCE

A. The BAS system shall be designed and installed, commissioned and serviced by independent factory trained personnel. BMS contractor shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment. The BMS contractor shall provide full time, on site, experienced project manager for this work, responsible for direct supervision of the design, installation, start up and commissioning of the B.M.S. The Bidder shall be regularly engaged in the installation and maintenance of BMS systems and shall have a minimum of ten (10) years of demonstrated technical expertise and experience in the installation and maintenance of B.M.S. systems similar in size and complexity to this project.

B. The BMS contractor shall maintain a service organization consisting of factory trained service personnel and provide a list of 10 projects, similar in size and scope to this project, completed within the last five years.

C. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.

D. All BAS peer-to-peer network controllers, central system controllers, and local user displays shall be UL Listed under Standard UL 916, category PAZX; Standard ULC C100, category UUKL7; and under Standard UL 864, categories UUKL, UDTZ, and QVAX and be so listed at the time of bid. All floor level controllers shall comply, at a minimum, with UL

Standard UL 91 6category PAZX; Standard UL 864, categories UDTZ, and QVAX and be so listed at the time of Bid.

E. The BAS peer-to-peer network controllers shall also comply with the European Electromagnetic Compatibility (EMC) Framework, and bear the C-Tic Mark to show compliance. The purpose of the regulation is to minimize electromagnetic interference between electronic products, which may diminish the performance of electrical products or disrupt essential communications.

F. DDC peer-to-peer controllers shall be compliant with the European EMC Directive, Standards EN 50081-2 and EN 50082-2, at the Industrial Levels. Additionally the equipment shall be compliant with the European LVD Directive and bear the CE mark in order to show compliance to both directives.

G. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, and Governing Radio Frequency Electromagnetic Interference and be so labeled.

H. The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

I. This system shall have a documented history of compatibility by design for a minimum of 15 years. Future compatibility shall be supported for no less than 10 years. Compatibility shall be defined as the ability to upgrade existing field panels to current level of technology, and extend new field panels on a previously installed network. Compatibility shall be defined as the ability for any existing field panel microprocessor to be connected and directly communicate with new field panels without bridges, routers or protocol converters.

1.7. CODES AND STANDARDS

A. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:
   1. National Electric Code (NEC)
   2. Local Building Code

1.8. SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).

1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.
2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.
3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, control loops, and similar control logic shall automatically refresh within 6 sec.
4. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.
5. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
6. Performance. Programmable controllers shall be able to completely execute DDC control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
7. Multiple Alarm Annunciations. Each workstation on the network shall receive alarms within 5 sec of other workstations.

1.9. SUBMITTALS

A. Product Submittal Requirements. Begin no work until submittals have been approved for conformity with design intent. Provide drawings as AutoCAD 2014 files on optical disk (file format:.dwg) or hard copies on 11" x 17" prints of each drawing. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means. Clearly reference covered specification and drawing on each submittal. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work.

B. Submittal data shall consist of the following:
   1. Direct Digital Control System Hardware:
      Complete bill of materials indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
      Manufacturer's description and technical data, such as product specification sheets, installation and maintenance instructions for items listed below and for relevant items not listed below:
      Direct Digital Controllers (controller panels)
      Transducers and transmitters
      Sensors (including accuracy data)
      Valves
      Dampers
      Relays and Switches
      Control Panels
      Power Supplies
      Operator Interface Equipment
      Pnuematic control valves with air side accessories and intefaces,
      Wiring diagrams and layouts for each control panel. Show all termination numbers.
   2. Central System Hardware and Software:

Schematic diagrams of all control, communication, and power wiring for central system installation. Show interface wiring to control system.

Graphics shall match existing.

Point naming convention shall match existing.

3. Controlled Systems:

Riser diagrams showing control network layout, communication protocol, and wire types.

Schematic diagram of each controlled system. Label control points with point names. Graphically show locations of control elements.

Schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic use the same name.

Instrumentation list for each controlled system. List control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.

Complete description of control system operation including sequences of operation. Include and reference schematic diagram of controlled system.

Point list for each system controller including both inputs and outputs (I/O), point numbers, controlled device associated with each I/O point, and location of I/O device.

4. Description of process, report formats and checklists to be used in Part 3: "Control System Demonstration and Acceptance."

C. Project Record Documents: Submit record (as-built) documents upon completion of installation. Submittal shall consist of:

1. Project Record Drawings. As-built versions of the submittal shop drawings provided as AutoCAD 2014 files on optical media and as 11" x 17" prints.
2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Part 3: "Control System Demonstration and Acceptance."
3. Operation and Maintenance (O & M) Manual.

As-built versions of the submittal product data.

Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems.

Operator's Manual with procedures for operating control systems, logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing set points and variables.

Programming manual or set of manuals with description of programming language and of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.

Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.

Documentation of all programs created using custom programming language, including set points, tuning parameters, and object database.

Graphic files, programs, and database on magnetic or optical media.

List of recommended spare parts with part numbers and suppliers.

Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware, including computer equipment and sensors.

Complete original original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.

Licenses, guarantees, and warranty documents for equipment and systems.

Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

O& M manuals provided after completion of project.

D. Training Materials. Provide course outline and manuals at least six weeks before training.

1.10. WARRANTY

A. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Failures on control systems that include all computer equipment, transmission equipment and all sensors and control devices during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.

B. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.

C. If Engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, Engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.

D. Provide updates to operator workstation software, project-specific software, graphic software, database software, and firmware that resolve Contractor identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with the above-mentioned items. Do not install updates or upgrades without Owner's written authorization.

1.11. TEMPERATURE CONTROL POINTS LIST

A. See attached Appendix A for required list of control points.

1.12. MEASURMENT POINTS FOR TRENDING

A. See attached Appendix B for required measurement points.

B. Reports to be sent monthly to owner. Measurement report to be in a CSV (comma seperated values) format.

PART 2 - PRODUCTS

2.1. COMMUNICATION

A. The design of the BMS shall support networking of operator workstations and Building Controllers. The network architecture shall consist of two levels, an Ethernet based primary network for all operator workstations, servers, and primary DDC controllers along with secondary Floor Level Networks (FLN) for terminal equipment application specific controllers.

B. Access to system data shall not be restricted by the hardware configuration of the building management system. The hardware configuration of the BMS network shall be totally transparent to the user when accessing data or developing control programs.

C. Operator Workstation Communication:
   1. All color graphic operator workstations shall reside on the Ethernet network and the consoles shall be set up in a client/server configuration.
   2. The servers will act as the central database for system graphics and databases to provide consistency throughout all system workstations.
   3. The network shall allow concurrent use of multiple BMS software site licenses.

D. Management Level Network Communication (MLN)
   1. All PCs shall simultaneously direct connect to the Ethernet Management Level Network without the use of an interposing device.
   2. The Primary Network shall not impose a maximum constraint on the number of operator workstations.
   3. Any controller residing on the primary network shall connect to Ethernet network without the use of a PC or a gateway with a hard drive.
   4. Any PC on the Primary Network shall have transparent communication with controllers on the building level networks connected via Ethernet.
   5. Any break in Ethernet communication from the PC to the controllers on the Primary Network shall result in a notification at the PC.
   6. The standard client and server workstations on the Primary Network shall reside on industry standard Ethernet utilizing standard TCP/IP, IEEE 802.3.
   7. System software applications will run as a service to allow communication with Primary Network Controllers without the need for user log in. Closing the application or logging off shall not prevent the processing of alarms, network status, panel failures, and trend information.
   8. Any break in Ethernet communication between the standard client and server workstations on the Primary Network shall result in a notification at each workstation.
   9. Access to the system database shall be available from any standard client workstation on the Primary Network.

10. Client access to client-server workstation configurations over the Internet network shall be available via Web browser interface.
11. Thin Client access to client-server workstation configurations via Windows Terminal Services shall provide multiple, independent sessions of the workstations software. Terminal Services clients shall have full functionality, without the need to install the workstation software on the local hard drive.

E. Primary Network - Panel to Panel Communication:
1. All Building Controllers shall directly reside on the primary Ethernet network such that communications may be executed directly between Building Controllers, directly between server and Building Controllers on a peer-to-peer basis.
2. Systems that operate via polled response or other types of protocols that rely on a central processor, file server, or similar device to manage panel-to-panel or device-to-device communications shall not be acceptable.
3. All operator interfaces shall have the ability to access all point status and application report data or execute control functions for any and all other devices. Access to data shall be based upon logical identification of building equipment. No hardware or software limits shall be imposed on the number of devices with global access to the network data.
4. The primary network shall use TCP/IP over Ethernet. All devices must:
   Auto-sense 10/100 Mbps networks.
   Receive an IP Address from a Dynamic Host Configuration Protocol (DHCP) Server or be configured with a Fixed IP Address.
   Resolve Name to IP Addresses for devices using a Domain Name Service (DNS) Server on the Ethernet network.
   Allow MMI access to an individual Primary Network Controller using industry standard Telnet software to view and edit entire Primary Network.
5. The primary network shall provide the following minimum performance:
   Provide high-speed data transfer rates for alarm reporting, report generation from multiple controllers and upload/download efficiency between network devices. System performance shall insure that an alarm occurring at any Building Controller is displayed at any PC workstations, all Building controllers, and other alarm printers within 15 seconds.
   Message and alarm buffering to prevent information from being lost.
   Error detection, correction, and re-transmission to guarantee data integrity.
   Synchronization of real-time clocks between Building Controllers, including automatic daylight savings time corrections.
   The primary network shall allow the Building Controllers to access any data from, or send control commands and alarm reports directly to, any other Building Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. Building Controllers shall send alarm reports to multiple operator workstations without dependence upon a central or intermediate processing device. The network shall also allow any Building controller to access, edit, modify, add, delete, back up, restore all system point database and all programs.
   The primary network shall allow the Building Controllers to assign password access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and control only the points that the operator is authorized for. All other points shall not be displayed at the PC workstation or portable terminal. (e.g. all base building and all tenant points shall be accessible to

any base building operators, but only certain base building and tenant points shall be accessible to tenant building operators). Passwords and priorities for every point shall be fully programmable and adjustable.

Devices containing custom programming must reside on the Primary Network

F. Secondary Network - Application Specific Controller Communication:
   1. Communication over the secondary network shall be the manufacturer's standard protocol.
   2. This level communication shall support a family of application specific controllers for terminal equipment.
   3. The Application Specific Controllers shall communicate bi-directionally with the primary network through Building Controllers for transmission of global data.
   4. A maximum of 30 terminal equipment controllers may be configured on individual secondary network trunks to insure adequate global data and alarm response times.

G. Internet Based Communication:
   1. Terminal Services Operator Interface

      Client access to client-server workstation configurations over low-bandwidth network technologies shall be available optionally via Windows Terminal Services or Web browser interface. Remote client access via Windows Terminal Services shall provide multiple, independent sessions of the workstations software - Terminal Services clients shall have workstation software access, without the need to install the workstation software on the local hard drive.

H. Remote Notification Paging System:
   1. Workstations shall be configured to send out messages to numeric pagers, alphanumeric pagers, phones (via text to speech technology), SMS (Simple Messaging Service, text messaging) Devices, and email accounts based on a point's alarm condition.
   2. There shall be no limit to the number of points that can be configured for remote notification of alarm conditions and no limit on the number of remote devices which can receive messages from the system.
   3. On a per point basis, system shall be configurable to send messages to an individual or group and shall be configurable to send different messages to different remote devices based on alarm message priority level.
   4. Remote devices may be scheduled as to when they receive messages from the system to account for operators' work schedules.
   5. System must be configurable to send messages to an escalation list so that if the first device does not respond, the message is sent on to the next device after a configurable time has elapsed.
   6. Message detail shall be configurable on a per user basis.
   7. During a "flood" of alarms, remote notification messages shall have the ability to optimize several alarms into an individual remote notification message.
   8. Workstation shall have the ability to send manual messages allowing an operator to type in a message to be sent immediately.
   9. Workstation shall have a feature to send a heartbeat message to periodically notify users that they have communication with the system.

2.2. OPERATOR INTERFACE:

A. Existing SIEMENS APOGEE INSIGHT Operator Interface Software:
   1. The existing operator interface software system will remain in use for current campus DDC control equipment.

B. Provide a new SIEMENS Desigo CC operator interface software package and all licensing, as described in the general section of this specification, for use on Deyo Hall under this project. The Desigo software package shall include all of the following:
   1. Basic Interface Description. New work to be compatible with existing.
      Operator interface software minimizes operator training through the use of user-friendly and interactive graphical applications, 30-character English language point identification, on-line help, and industry standard Windows application software. Interface software shall simultaneously communicate with and share data between Ethernet-connected building level networks.
      Provide a graphical user interface that shall minimize the use of keyboard through the use of a mouse or similar pointing device, with a "point and click" approach to menu selection and a "drag and drop" approach to inter-application navigation.
      The navigation shall be user friendly by utilizing "forward & back" capability between screens and embedded hyperlinks to open graphics, documents, drawings, etc.
      Selection of applications within the operator interface software shall be via a graphical toolbar menu - the application toolbar menu shall have the option to be located in a docked position on any of the four sides of the visible desktop space on the workstation display monitor, and the option to automatically hide itself from the visible monitor workspace when not being actively manipulated by the user.
      The graphical toolbar menu shall have the option of adding additional user definable buttons that can launch local or network programs, files, folders on Internet/Intranet addresses external to the BMS software.
      The software shall provide a multi-tasking type environment that allows the user to run several applications simultaneously. BMS software shall run on a Windows 10 operating system. System database parameters shall be stored within an object-oriented database. Standard Windows applications shall run simultaneously with the BMS software. The mouse or Alt-Tab keys shall be used to quickly select and switch between multiple applications. The operator shall be able to work in Microsoft Word, Excel, and other Windows based software packages, while concurrently annunciating on-line BMS alarms and monitoring information
      The software shall provide, as a minimum, the following functionality:
         Real-time graphical viewing and control of the BMS environment
         Reporting
         Scheduling and override of building operations
         Collection and analysis of historical data
         Point database editing, storage and downloading of controller databases.
         Utility for combining points into logical Point Groups. The Point Groups shall then be manipulated in Graphics, trend graphs and reports in order to streamline the navigation and usability of the system.

Alarm reporting, routing, messaging, and acknowledgment

"Collapsible tree," dynamic system architecture diagram application:

a. Showing the real-time status and definition details of all workstations and devices on a management level network
b. Showing the real-time status and definition details of all Building Controllers at the Primary Network.
c. Showing the definition details of all application specific controllers

Definition and construction of dynamic color graphic displays.

Online, context-sensitive help, including an index, glossary of terms, and the capability to search help via keyword or phrase.

On-screen access to User Documentation, via online help or PDF-format electronic file.

Automatic database backup at the operator interface for database changes initiated at Building Controllers.

Display dynamic trend data graphical plot.

a. Must be able to run multiple plots simultaneously
b. Each plot must be capable of supporting 10 pts/plot minimum
c. Must be able to command points directly off dynamic trend plot application.
d. Must be able to plot both real-time and historical trend data

Program editing

Report output shall have the option to be sent to an email address or group of email addresses.

Enhanced Functionality:

Provide functionality such that any of the following may be performed simultaneously on-line, and in any combination, via adjustable user-sized windows. Operator shall be able to drag and drop information between the following applications, reducing the number of steps to perform a desired function (e.g., Click on a point on the alarm screen and drag it to the dynamic trend graph application to initiate a dynamic trend on the desired point):

a. Dynamic color graphics application
b. Alarm management application
c. Scheduling application
d. Dynamic trend graph data plotter application
e. Dynamic system architecture diagram application
f. Control Program and Point database editing applications
g. Reporting applications

Report and alarm printing shall be accomplished via Windows Print Manager, allowing use of network printers.

Security: Operator-specific password access protection shall be provided to allow the administrator/manager to limit users' workstation control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned password. Operator privileges shall "follow" the operator to any workstation logged onto (up to 999 user accounts shall be supported). The administrator or manager shall be able to grant discrete levels of access and privileges, per user, for each point, graphic, report, schedule, and BMS workstation application. And each BMS workstation user account shall use a Windows Operating System user account as a foundation.

The operator interface software shall also include an application to track the actions of each individual operator, such as alarm acknowledgement, point

commanding, schedule overriding, database editing, and logon/logoff. The application shall list each of the actions in a tabular format, and shall have sorting capabilities based on parameters such as ascending or descending time of the action, or name of the object on which the action was performed. The application shall also allow querying based on object name, operator, action, or time range.

Dynamic Color Graphics application shall include the following:

Must include graphic editing and modifying capabilities

A library of standard control application graphics and symbols must be included

Must be able to command points directly off graphics application

Graphic display shall include the ability to depict real-time point values dynamically with animation, picture/frame control, symbol association, or dynamic informational text-blocks

Navigation through various graphic screens shall be optionally achieved through a hierarchical "tree" structure

Graphics viewing shall include zoom capabilities

Graphics shall be capable of displaying the status of points that have been overridden by a field HAND switch, for points that have been designed to provide a field HAND override capability.

Advanced linking within the Graphics application shall provide the ability to navigate to outside documents (e.g.,.doc,.pdf,.xls, etc.), Internet web addresses, e-mail, external programs, and other workstation applications, directly from the Graphics application window with a mouse-click on a customizable link symbol.

Reports shall be generated on demand or via pre-defined schedule, and directed to CRT displays, printers, file or email address. As a minimum, the system shall allow the user to easily obtain the following types of reports:

A general listing of all or selected points in the network

List of all points currently in alarm

List of all points currently in override status

List of all disabled points

List of all points currently locked out

List of user accounts and access levels

List all weekly schedules and events

List of holiday programming

List of control limits and deadbands

Custom reports from 3rd party software

System diagnostic reports including, list of Building panels on line and communicating, status of all Building terminal unit device points

List of programs

List of point definitions

List of logical point groups

List of alarm strategy definitions

List of Building Control panels

Point totalization report

Point Trend data listings

Initial Values report

User activity report

Scheduling and override

Provide a calendar type format for simplification of time and date scheduling and overrides of building operations. Schedule definitions reside in the PC workstation and in the Building Controller to ensure time equipment scheduling when PC is off-line, PC is not required to execute time scheduling. Provide override access through menu selection, graphical mouse action or function key. Provide the following capabilities as a minimum:

a. Weekly schedules
b. Zone schedules
c. Event schedules - an event consists of logical combinations of equipment and/or zones
d. Report schedules
e. Ability to schedule for a minimum of up to ten (10) years in advance.

Additionally, the scheduling application shall:

a. Provide filtering capabilities of schedules, based on name, time, frequency, and schedule type (event, zone, report)
b. Provide sorting capabilities of schedules, based on name, time and type of schedule (zone, event, report)
c. Provide searching capabilities of schedules based on name - with wildcarding options

Collection and Analysis of Historical Data

Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals (up to four time-based definitions per point) or change of value, both of which shall be user-definable. Trend data shall be collected stored on hard disk for future diagnostics and reporting. Automatic Trend collection may be scheduled at regular intervals through the same scheduling interface as used for scheduling of zones, events, and reports. Additionally, trend data may be archived to network drives or removable disk media for future retrieval.

Trend data reports shall be provided to allow the user to view all trended point data. Reports may be customized to include individual points or predefined groups of selected points. Provide additional functionality to allow predefined groups of up to 250 trended points to be easily transferred on-line to Microsoft Excel. BMS contractor shall provide custom designed spreadsheet reports for use by the owner to track energy usage and cost, equipment run times, equipment efficiency, and/or building environmental conditions. BMS contractor shall provide setup of custom reports including creation of data format templates for monthly or weekly reports.

Provide additional functionality that allows the user to view real-time trend data on trend graphical plot displays. A minimum of ten points may be plotted, of either real-time or historical data. The dynamic graphs shall continuously update point values. At any time the user may redefine sampling times or range scales for any point. In addition, the user may pause the display and take "snapshots" of plot screens to be stored on the workstation disk for future recall and analysis. Exact point values may be viewed and the graphs may be printed. A minimum of ten (10) dynamic graphs shall run simultaneously. Operator shall be able to command points directly on the trend plot by double clicking on the point. Operator shall be able to zoom in on a specific time range within a

plot. The dynamic trend plotting application shall support the following types of graphs, with option to graph in 3D: line graph, area graph, curve graph, area-curve graph, step graph, and scatter graph. Each graph may be customized by the user, for graph type, graph text, titles, line styles and weight, colors, and configurable x- and y-axes.

Provide additional functionality that allows the user to display trend data for points from a graphic, alarm status screen, or a displayed point log report.

Dynamic Color Graphic Displays

Capability to create color graphic floor plan displays and system schematics for each piece of mechanical equipment, including, but not limited to, air handling units, chilled water systems, hot water boiler systems, and room level terminal units.

The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection, point alarm association, or text-based commands. Graphics software shall permit the importing of Autocad or scanned pictures for use in the system.

Dynamic temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations within the system schematics or graphic floor plan displays, and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates.

a. Provide the user the ability to display real-time point values by animated motion or custom picture control visual representation. Animation shall depict movement of mechanical equipment, or air or fluid flow. Picture Control shall depict various positions in relation to assigned point values or ranges. A library (set) of animation and picture control symbols shall be included within the operator interface software's graphics application. Animation shall reflect, ON or OFF conditions, and shall also be optionally configurable for up to five rates of animation speed.
b. Sizable analog bars shall be available for monitor and control of analog values; high and low alarm limit settings shall be displayed on the analog scale. The user shall be able to "click and drag" the pointer to change the setpoint.
c. Provide the user the ability to display blocks of point data by defined point groups; alarm conditions shall be displayed by flashing point blocks.
d. Equipment state or values can be changed by clicking on the associated point block or graphic symbol and selecting the new state (on/off) or setpoint.
e. State text for digital points can be user-defined up to eight characters.
f. Provide the user the ability to display trend data from the graphic screen through right click feature selection.

Colors shall be used to indicate status and change as the status of the equipment changes. The state colors shall be user definable.

Advanced linking within the Graphics application shall provide the ability to navigate to outside documents (e.g.,.doc,.pdf,.xls, etc.), Internet web addresses, e-mail, external programs, and other workstation applications,

directly from the Graphics application window with a mouse-click on a customizable link symbol.

The Windows environment of the PC operator workstation shall allow the user to simultaneously view several applications at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.

Off the shelf graphic software shall be provided to allow the user to add, modify or delete system graphic background displays.

A clipart library of HVAC application and automation symbols shall be provided including fans, valves, motors, chillers, AHU systems, standard ductwork diagrams and laboratory symbols. The user shall have the ability to add custom symbols to the clipart library. The clipart library shall include a minimum of 400 application symbols. In addition, a library consisting of a minimum of 700 graphic background templates shall be provided.

The Graphics application shall include a set of standard Terminal Equipment controller application-specific background graphic templates. Templates shall provide the automatic display of a selected Terminal Equipment controller's control values and parameters, without the need to create separate and individual graphic files for each controller.

The graphic application shall provide a tool be able to change full or partial point names on a graphic.

System Configuration & Definition

A "Collapsible tree," dynamic system architecture diagram/display application of the site-specific BMS architecture showing status of controllers, PC workstations and networks shall be provided. This application shall include the ability to add and configure workstations, Building Controllers, as well as 3rd-party integrated components. Symbols/Icons representing the system architecture components shall be user-configurable and customizable, and a library of customized icons representing 3rd-party integration solutions shall be included. This application shall also include the functionality for real-time display, configuration and diagnostics connections to Building Controllers.

Network wide control strategies shall not be restricted to a single Building Controller, but shall be able to include data from any and all other network panels to allow the development of Global control strategies.

Provide automatic backup and restore of all Building controller databases on the workstation hard disk. In addition, all database changes shall be performed while the workstation is on-line without disrupting other system operations. Changes shall be automatically recorded and downloaded to the appropriate Building Controller. Changes made at the user-interface of Building Controllers shall be automatically uploaded to the workstation, ensuring system continuity.

System configuration, programming, editing, graphics generation shall be performed on-line.

Point database configuration shall be available to the user within a dedicated point database editor application included in the operator interface software. The editor shall allow the user to create, view existing, modify, copy, and delete points from the database.

The point editor shall have the capability to assign "informational text" to points as necessary to provide critical information about the equipment.

The point editor shall also allow the user to configure the alarm management strategy for each point. The editor shall provide the option for editing the point database in an online or offline mode with the Building Controllers.

The operator interface software shall also provide the capability to perform bulk modification of point definition attributes to a single or multiple user-selected points. This function shall allow the user to choose the properties to copy from a selected point to another point or set of points. The selectable attributes shall include, but are not limited to, Alarm management definitions and Trend definitions.

Control program configuration shall be available to the user within a dedicated control program editor application included in the operator interface software. The editor shall allow for creation, modification and deletion of control programs. The editor shall include a programming assistance feature that interactively guides the user through parameters required to generate a control program. The editor shall also include the ability to automatically compile the program to ensure its compatibility with the Building Controllers. The editor shall provide the option for editing the control programs in an online or offline mode, and also the ability to selectively enable or disable the live program execution within the Building Controllers. Additional compiler checks shall be built into the program editor which assists in the verification of valid GOTO statements. The additional compiler check shall also verify if each point in the program was defined in another panel.

Alarm Management

Alarm Routing shall allow the user to send alarm notification to selected printers or workstation location(s) based on time of day, alarm severity, or point type.

Alarm Notification shall be presented to each workstation in a tabular format application, and shall include the following information for each alarm point: name, value, alarm time & date, alarm status, priority, acknowledgement information, and alarm count. Each alarm point or priority shall have the ability to sound a discrete audible notification.

Alarm Display shall have the ability to list & sort the alarms based on alarm status, point name, ascending or descending alarm time.

Directly from the Alarm Display, the user shall have the ability to acknowledge, silence the alarm sound, print, or erase each alarm. The interface shall also have the option to inhibit the erasing of active acknowledged alarms, until they have returned to normal status. The user shall also have the ability to command, launch an associated graphic or trended graphical plot, or run a report on a selected alarm point directly on the Alarm Display.

Each alarm point shall have a direct link from the Alarm Display to further user-defined point informational data. The user shall have the ability to also associate real-time electronic annotations or notes to each alarm.

Alarm messages shall be customizable for each point, or each alarm priority level, to display detailed instructions to the user regarding actions to take in the event of an alarm. Alarm messages shall also have the optional ability to individually enunciate on the workstation display via a separate pop-up window, automatically being generated as the associated alarm condition occurs. The system shall have the ability to modify the priority text based on operator preference.

Alarm Display application shall allow workstation operators to send and receive real-time messages to each other, for purposes of coordinating Alarm and BMS system management.

Remote notification of messages

Operator Interface software shall be configured to send out messages to numeric pagers, alphanumeric pagers, phones (via text to speech technology), SMS (Simple Messaging Service, text messaging) Devices, and email accounts based on a point's alarm condition.

There shall be no limit to the number of points that can be configured for remote notification of alarm conditions and no limit on the number of remote devices which can receive messages from the system.

On a per point basis, system shall be configurable to send messages to an individual or group and shall be configurable to send different messages to different remote devices based on alarm message priority level.

Remote devices may be scheduled as to when they receive messages from the system to account for operators' work schedules.

System must be configurable to send messages to an escalation list so that if the first device does not respond, the message is sent on to the next device after a configurable time has elapsed.

Message detail shall be configurable on a per user basis.

During a "flood" of alarms, remote notification messages shall have the ability to optimize several alarms into an individual remote notification message.

Workstation shall have the ability to send manual messages allowing an operator to type in a message to be sent immediately.

Workstation shall have a feature to send a heartbeat message to periodically notify users that they have communication with the system.

2.3. BUILDING CONTROLLER SOFTWARE

A. General

1. Furnish the following applications software to form a complete operating system for building and energy management as described in this specification.
2. The software programs specified in this Section shall be provided as an integral part of Building Controllers and shall not be dependent upon any higher level computer or another controller for execution.
3. All points, panels and programs shall be identified by a 30 character name. All points shall also be identified by a 16 character point descriptor. The same names shall be displayed at both Building Controller and the Operator Interface.
4. All digital points shall have a user defined two-state status indication with 8 characters minimum (e.g. Summer, Enabled, Disabled, Abnormal).
5. Building Controllers shall have the ability to perform energy management routines including but not limited to time of day scheduling, calendar-based scheduling, holiday scheduling, temporary schedule overrides, start stop time optimization, automatic daylight savings time switch over, night setback control, enthalpy switch over, peak demand limiting, temperature-compensated duty cycling, heating / cooling interlock, supply temperature reset, priority load shedding, and power failure restart.
6. The Building Controllers shall have the ability to perform the following pre tested control algorithms:
   Two position control
   Proportional control

Proportional plus integral control
Proportional, integral, plus derivative control
Automatic tuning of control loops
Model-Free Adaptive Control

7. Each controller shall be provided with an interactive HELP function to assist operators using POTs and remote connected operators.

B. System Security
   1. User access shall be secured using individual security passwords and user names.
   2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
   3. Building Controllers shall be able to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any Operator Interface or portable operator terminal) shall enable the operator to monitor, adjust and control only the points that the operator is authorized for. All other points shall not be displayed at the Operator Interface or portable terminal. Passwords and priorities for every point shall be fully programmable and adjustable.
   4. User Log On / Log Off attempts shall be recorded.
   5. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.
   6. Use of workstation resident security as the only means of access control is not an acceptable alternative to resident system security in the field panel.

C. User Defined Control Applications
   1. Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
   2. It shall be possible to use any system measured point data or status, any system calculated data, a result from any process, or any user-defined constant in any controller in the system.
   3. Any process shall be able to issue commands to points in any and all other controllers in the system.
   4. Processes shall be able to generate operator messages and advisories to other operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.
   5. Each controller shall support plain language text comment lines in the operating program to allow for quick troubleshooting, documentation, and historical summaries of program development.
   6. Controller shall provide a HELP function key, providing enhanced context sensitive on-line help with task oriented information from the user manual.

D. Alarm Management
   1. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each Building Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the Building Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.

2. Conditional alarming shall allow generation of alarms based upon user defined multiple criteria.
3. An Alarm "shelving" feature shall be provided to disable alarms during testing. (Pull the Plug, etc.).
4. Binary Alarms. Each binary object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
5. Analog Alarms. Each analog object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.
6. All alarm or point change reports shall include the point's user defined language description and the time and date of occurrence.
7. The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, Building Controller, etc.) to provide full flexibility in defining the handling of system alarms. Each Building Controller shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.
8. Alarm reports and messages shall be routed to user-defined list of operator workstations, or other devices based on time and other conditions. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display graphics.
9. In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 200 character alarm message to more fully describe the alarm condition or direct operator response.
   Each Building Controller shall be capable of storing a library of at least 50 alarm messages. Each message may be assignable to any number of points in the Controller.
10. Operator-selected alarms shall be capable of initiating a call to a remote operator device.

E. Scheduling
1. Provide a comprehensive menu driven program to automatically start and stop designated object or group of objects in the system according to a stored time.
2. Schedules shall reside in the building controller and shall not rely on external processing or network.
3. It shall be possible to define a group of objects as a custom event (i.e. meeting, athletic activity, etc.). Events can then be scheduled to operate all necessary equipment automatically.
4. For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start and/or stop within that group.
5. The operator shall be able to define the following information:
   Time, day
   Commands such as on, off, auto, etc.
   Time delays between successive commands.
   There shall be provisions for manual overriding of each schedule by an authorized operator.
6. It shall be possible to schedule calendar-based events up to one year in advance based on the following:

Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. When a group of objects are scheduled together as an Event, provide the capability to adjust the start and stop times for each member.

Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.

Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.

F. Peak Demand Limiting capability (PDL):
   1. The Peak Demand Limiting (PDL) program shall limit the consumption of electricity to prevent electrical peak demand charges.
   2. PDL shall continuously track the amount of electricity being consumed, by monitoring one or more electrical kilowatt-hour/demand meters. These meters may measure the electrical consumption (kWh), electrical demand (kW), or both.
   3. PDL shall sample the meter data to continuously forecast the demand likely to be used during successive time intervals.
   4. If the PDL forecasted demand indicates that electricity usage is likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads.
   5. Ability to initialize and restart the meter area directly from the workstation.

G. Temperature-compensated duty cycling capability.
   1. The DCCP (Duty Cycle Control Program) shall periodically stop and start loads according to various patterns.
   2. The loads shall be cycled such that there is a net reduction in both the electrical demands and the energy consumed.

H. Automatic Daylight Savings Time Switchover: The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.

I. Night setback control. The system shall provide the ability to automatically adjust setpoints for night control.

J. Enthalpy switchover (economizer). The Building Controller Software (BCS) shall control the position of the air handler relief, return, and outside air dampers. If the outside air dry bulb temperature falls below changeover set point the BCS will modulate the dampers to provide 100 percent outside air. The user will be able to quickly changeover to an economizer system based on dry bulb temperature and will be able to override the economizer cycle and return to minimum outside air operation at any time.

K. Loop Control. A Model-Free Adaptive Control algorithm or alternatively a PID (proportional-integral-derivative) closed-loop control algorithm with direct or reverse

action and anti-windup shall be supplied. The algorithm shall calculate a time-varying analog value that is used to position an output or stage a series of outputs. The controlled variable, set point, and weighting parameters shall be user-selectable.

L. Sequencing. Provide application software based upon the sequences of operation specified to properly sequence equipment.

M. Staggered Start
   1. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user definable.
   2. Upon the resumption of power, each Building Controller shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling and turn equipment on or off as necessary to resume normal operations.

N. Totalization
   1. Run-Time Totalization. Building Controllers shall automatically accumulate and store run-time hours for all digital input and output points. A high runtime alarm shall be assigned, if required, by the operator.
   2. Consumption totalization. Building Controllers shall automatically sample, calculate and store consumption totals on a daily, weekly or monthly basis for all analog and digital pulse input type points.
   3. Event totalization. Building Controllers shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly or monthly basis for all points. The event totalization feature shall be able to store the records associated with events before reset.

O. Data Collection
   1. A variety of historical data collection utilities shall be provided to manually or automatically sample, store, and display system data for all points.
   2. Building Controllers shall store point history data for selected analog and digital inputs and outputs:
      Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each Building Controllers point group.
      Two methods of collection shall be allowed: either by up to four pre-defined time intervals and/or upon a pre-defined change of value. Sample intervals of l minute to 7 days shall be provided.
      Each Building Controller shall have a dedicated RAM-based buffer for trend data and shall be capable of storing a minimum of 10,000 data samples.
   3. Trend data shall be stored at the Building Controllers and uploaded to the workstation when retrieval is desired. Uploads shall occur based upon either user-defined interval, manual command or when the trend buffers are full. All trend data shall be available for use in 3rd party personal computer applications.
   4. Loop Tuning. Building Controllers shall also provide high resolution sampling capability for verification of DDC control loop performance. Documented evidence of tuned control loop performance shall be provided on a <monthly, seasonal, quarterly, annual> period.

For Model-Free Adaptive Control loops, evidence of tuned control loop performance shall be provided via graphical plots or trended data logs. Graphical plots shall minimally include depictions of setpoint, process variable (output), and control variable (e.g., temperature). Other parameters that may influence loop control shall also be included in the plot (e.g., fan on/off, mixed-air temp).

For PID control loops, operator-initiated automatic and manual loop tuning algorithms shall be provided for all operator-selected PID control loops. Evidence of tuned control loop performance shall be provided via graphical plots or trended data logs for all loops.

In automatic mode, the controller shall perform a step response test with a minimum one-second resolution, evaluate the trend data, calculate the new PID gains and input these values into the selected LOOP statement.

Loop tuning shall be capable of being initiated either locally at the Building Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.

2.4. BUILDING CONTROLLERS

A. Building Controllers shall be 32 bit, multi-tasking, multi-user, real-time 48 MHz digital control processors consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules. Controller size shall be sufficient to fully meet the requirements of this specification and the attached point list.

B. Each Building Controller shall support a minimum of 3 directly connected Secondary Networks.

C. Each Building Controller shall have sufficient memory, a minimum of 72 megabyte, to support its own operating system and databases, including control processes, energy management applications, alarm management applications, historical/trend data for points specified, maintenance support applications, custom processes, operator I/O, and dial-up communications.

D. Building Controller shall have an integral real-time clock.

E. Each Building Controller shall support firmware upgrades without the need to change hardware.

F. Each Building Controller shall support:
   1. Monitoring of industry standard analog and digital inputs, without the addition of equipment outside the Building Controller cabinet.
   2. Monitoring of industry standard analog and digital outputs, without the addition of equipment outside the Building Controller cabinet.

G. Serial Communication. Building Controllers shall provide at least two EIA-232C serial data communication ports for operation of operator I/O devices such as industry

standard printers, operator terminals, and portable laptop operator's terminals. Building Controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected printers or terminals.

H. Manual Override. The operator shall have the ability to manually override automatic or centrally executed commands at the Building Controller via local, point discrete, integral hand/off/auto operator override switches for all digital control type points and gradual switches for all analog control type points. These override switches shall be operable whether the panel processor is operational or not. Each Building Controller shall monitor and alarm the hand, off and auto positions of integral HOA switches.

I. I/O Status and Indication. Building Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Graduated intensity LEDs or analog indication of value shall also be provided for each analog output. All wiring connections shall be made to field-removable terminals.

J. Self Diagnostics. Each Building Controller shall continuously perform self diagnostics, communication diagnosis, and diagnosis of all panel components. The Building Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication for any system.

K. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all Building Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 100 hours.

L. Environment.
   1. Controller hardware shall be suitable for the anticipated ambient conditions.
   2. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).
   3. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).

M. Immunity to power and noise.
   1. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.
      Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
   2. Isolation shall be provided at all primary network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
      RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3 V
      Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact
      Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500 V signal, 1 kV power

Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max)

3. Isolation shall be provided at all Building Controller's AC input terminals to suppress induced voltage transients consistent with:
   IEEE Standard 587 1980
   UL 864 Supply Line Transients
   Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

2.5. APPLICATION SPECIFIC CONTROLLERS (ASC)

A. General

1. Provide for control of each piece of equipment, including, but not limited to the following:
   Heating Coils
   Cabinet Heaters
   Unit Heaters
   Radiant Heating System
   Energy Recovery Units and Accessories
   Finned Tube Radiatio Controls
   Exhaust Fans
   Laundry HVAC System
2. Each Building Controller shall be able to communicate with application specific controllers (ASCs) over the Secondary Network to control terminal equipment only.
3. The use of Secondary Network controllers with custom program applications to control AHU's, water systems, etc. is not acceptable.
4. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.
5. Each ASC shall include all point inputs and outputs necessary to perform the specified control sequences. The ASC shall accept input and provide output signals that comply with industry standards. Controllers utilizing proprietary control signals shall not be acceptable. Outputs utilized either for two-state, modulating floating, or proportional control, allowing for additional system flexibility.
6. Space Temperature Sensors. Each controller performing space temperature control shall be provided with a matching room temperature sensor.
   The space temperature sensor shall be available in wired and wireless versions.
   Wired Sensor specifications. The sensor may be either RTD or thermistor type providing the following.
   Accuracy:+.5 F
   Operating Range: - 55-95 deg F
   Set Point Adjustment Range:55 to 95 F
   Calibration Adjustments:None required
   Installation: Up to 100 ft. from controller
   Auxiliary Communications Port:as required
   Set Point Adjustment Dialas required
   Occupancy Override Switchas required
   Set Point Modes:
   Independent Heating, Cooling
   Night Setback-Heating
   Night Setback-Cooling

Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.

Set Point Adjustment Dial. The set point adjustment dial shall allow for modification of the temperature by the building operators. Set point adjustment may be locked out, overridden, or limited as to time or temperature through software by an authorized operator at any central workstation, Building Controller, room sensor two-line display, or via the portable operator's terminal.

Override Switch. An override switch shall initiate override of the night setback mode to normal (day) operation when activated by the occupant and enabled by building operators. The override shall be limited to two (2) hours (adjustable.) The override function may be locked out, overridden, or limited through software by an authorized operator at the operator interface, Building Controller, room sensor two-line display or via the portable operator's terminal.

7. Communication. Each controller shall perform its primary control function independent of other Secondary Network communication, or if Secondary Network communication is interrupted. Reversion to a fail-safe mode of operation during Secondary Network interruption is not acceptable.
8. Control Algorithms. The controller shall receive its real-time data from the Building Controller time clock to insure Secondary Network continuity. Each controller shall include algorithms incorporating proportional, integral and derivative (PID) gains for all applications. All PID gains and biases shall be field-adjustable by the user via room sensor LCD or the portable operator's terminal as specified herein. Controllers that incorporate proportional and integral (PI) control algorithms only shall not be acceptable.
9. Control Applications. Operating programs shall be field-selectable for specific applications. In addition, specific applications may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility. Controllers that require factory changes of all applications are not acceptable.
10. Calibration. Each controller shall include provisions for manual and automatic calibration of the differential pressure transducer in order to maintain stable control and insuring against drift over time.

    Manual calibration may be accomplished by either commanding the actuator to 0% via the POT or by depressing the room sensor override switch. Calibration of the transducer at the controller location shall not be necessary

    Calibration shall be accomplished by zeroing out the pressure sensor and holding damper at last known position until calibration is complete. The controller shall automatically accomplish this whenever the system mode switches from occupied to unoccupied or vice versa.
11. Memory.

    Provide each ASC with sufficient memory to accommodate point databases, operating programs, local alarming and local trending. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM, or minimum of 72-hour battery backup shall be provided. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration.

    Upon replacement, new ASCs shall recover control function and site specific defaults automatically and resume normal operation.

12. Power Supply. The ASCs shall be powered from a 24 VAC source and shall function normally under an operating range of 18 to 28 VAC, allowing for power source fluctuations and voltage drops. Power supply for the ASC must be rated at a minimum of 125% of ASC power consumption and shall be of the fused or current limiting type. The BMS contractor shall provide 24 VAC power to the terminal units by utilizing:
    120VAC circuits provided on each floor by the Division 26 contractor for power trunks. Additionally, Field panel to be provided with 120vac Emergency power by the Division 26 contractor.
13. Environment. The controllers shall function normally under ambient conditions of 32 to 122 F (0 to 50 C) and 10% to 95%RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the circuit board assembly.
14. Immunity to noise. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

2.6. INPUT/OUTPUT INTERFACE:

A. Hardwired inputs and outputs may tie into the system through building or application specific controllers.

B. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no damage to the controller.

C. Binary inputs shall allow the monitoring of On/Off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense “dry contact” closure without external power (other than that provided by the controller) being applied.

D. Pulse accumulation input objects. This type of object shall conform to all the requirements of binary input objects and also accept up to 10 pulses per second for pulse accumulation.

E. Analog inputs shall allow the monitoring of low-voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with-and field configurable to- commonly available sensing devices.

F. Binary outputs shall provide for On/Off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have three-position (On/Off/Auto) override switches and status lights. Outputs shall be selectable for either normally open or normally closed operation.

G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC, 4 to 20 mA or 0-20 PSI signal as required to provide proper control of the output device. Analog outputs on building or custom application controllers shall have status lights and a two-position (AUTO/MANUAL)

switch and manually adjustable potentiometer for manual override. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.

H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

I. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

2.7. POWER SUPPLIES AND LINE FILTERING

A. 120 Volt circuits will be provided to each floor by Division 26 for use by the BMS contractor to power control devices - Refer to Electrical drawings for locations. BMS contractor shall be responsible for providing step down transformers as required to provide the necessary voltage to the BMS equipment.

B. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in both primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

C. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand a 150% current overload for at least three seconds without trip-out or failure.
   1. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
   2. Line voltage units shall be UL recognized and CSA approved.

D. Power line filtering.
   1. Provide transient voltage and surge suppression for all workstations and controllers either internally or as an external component. Surge protection shall have the following at a minimum:
      Dielectric strength of 1000 volts minimum
      Response time of 10 nanoseconds or less
      Transverse mode noise attenuation of 65 dB or greater
      Common mode noise attenuation of 150 dB or better at 40 Hz to 100 Hz.

2.8. AUXILIARY CONTROL DEVICES

A. General
   1. Specified in this section are hard wired input/output devices connected to the Building Controller or ASC.

B. Automatic Dampers
   1. Dampers shall have 13 gauge galvanized frames of not less than 3" in width and blades of 14 gauge, equivalent thickness, galvanized steel roll formed airfoil type for low pressure drop and low noise generation and shall be adequately braced to from a rigid assembly where required in galvanized duct work. Dampers shall have blades not more 8" wide. Linkage and hardware shall be zinc plated steel and shall be concealed out of airstream within the damper frame. Damper blades and rods shall be installed in horizontal position.
   2. In copper, aluminum and stainless steel duct work, damper material shall match the duct work material.
   3. All dampers shall be of the proportioning or opposed blade type, and shall be motor operated. Dampers shall have continuous elastomer or stainless steel stops to avoid leakage. Bearings shall be corrosion resistant oil tight stainless steel sleeve type. All dampers shall be provided with continuous 3/16" x ½" closed cell neoprene gasket around perimeter of the frame and at interlocking blade edges to form an air tight seal. Blade seals shall be suitable for -76° F to 350°F mechanically locked into blade edge. Adhesive of clip on type are not acceptable. Axles shall be square or hexagonal positively locked into damper blade. Linkage shall be concealed out of airstream within the damper blade.
   4. All dampers shall be constructed to provide a maximum leakage of 3-1/2%, with an approach velocity of 1500 fpm when closed against a pressure of 4 inches of water. Submit leakage and flow characteristic data for all dampers.
   5. All outside air dampers, with the exception of the emergency generator dampers, shall automatically close in the event of a loss of power. Dampers on emergency generators shall automatically open on a loss of power.

C. Electric Damper Actuators
   1. General
      The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.
      Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing.
      Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range.
      All 24 VAC/VDC actuators shall operate on Class 2 wiring.
      All actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 7 Nm (60 in.-lb) torque capacity shall have a manual crank for this purpose.
      Electric actuators for emergency generator damper control shall be rated for 350 degree F. maximum operating temperature and capable to drive fully open and close within 15 seconds.

D. Automatic Control Valves

1. Low Temperature Hot Water Systems (90-200 degrees F):

Control valves shall be two-way or three-way type single seated globe type for two-position or modulating service as shown. Valves shall meet ANSI Class IV leakage rating.

Body pressure rating and connection type construction shall conform to pipe, fitting and valve schedules. Where pressure and flow combinations exceed ratings for commercial valves and operators, industrial class valves and operators shall be provided.

Valve operators shall be of the electric type.

The valves shall be quiet in operation and fail-safe in either normally open or normally closed position in the event of power failure. Terminal equipment valve will be fail-in-place

Control valve operators shall be sized to close against a differential pressure equal to the design pump head plus 10 percent.

Furnish differential pressure control valves for all water systems as shown on plans and/or specified in the sequence of operations.

Provide valves 2" and smaller with screwed end bronze bodies and stainless steel trim. Provide valves 2-1/2" and larger with flanged ends, cast iron body and stainless steel trim.

For modulating service that require large valve size (above 6"), such as cooling tower temperature bypass, chiller head pressure,etc. where proper control with globe type control valve cannot be achieved or the application is not economical butterfly or v-port ball valves are allowed.

Control valves for high temperature hot water shall be cast steel construction stainlesssteel trim, flanged and rated for 600 PSI.

2. Water Valves:

Control valves shall be of equal percentage flow characteristics for modulating service.

Sizing Criteria:

Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through the coil, 50% of the pressure difference between supply and return mains, or 5 psi, whichever is greater.

Three-way modulating service: Pressure drop equal to twice the pressure drop through the coil, 5 psi maximum.

Differential pressure service: 70% of design flow and 50% of pump head.

Water valves shall fail normally open or closed, as scheduled on plans, or as follows:

a. Heating coils in air handlers:normally open.
b. Differential pressure valves:normally open.
c. Terminal units:Fail in place
d. Other applications; as required by sequences of operation.

E. HIGH TEMPERATURE CONTROL VALVES

1. Temperature and Pressure rating: All valve components shall be rated for minimum campus HTHW service at 400 degrees F. and 400 psi.
2. Differential pressure: Valves shall be selected for a Campus stipulated 20 psi differential pressure rating.

3. Application: A single HTHW control valve shall be used on each heating heat exchanger (HE1, HE2).
4. Valve Body: 1" NPS, 2-way globe style control valve with cage guided balanced valve plug. Plug material S41600 SST, seat ring S41600 SST, stem S31600 SST. Flanged connections with raised face flange, ASTM A216 WCC carbon steel body rated for ANSI Class 300 for use to 600 psi, 600 degrees F. shutoff rating class ANSI CL IV, to 350 psi. Furnish with gaskets NO6600 Nickel Alloy, Graphite/ S31600 SST, SST flange studs & nuts.
5. Valve trim: Trim designation -1, metal seat, seal ring Carbon PTFE, backup ring EPR, packing single PTFE.
6. Pneumatic Actuator: 667 actuator with spring 1F1767 (368 lbf/in), size 30i, push down to close, operating range 0-18 psig, travel 3/4", Diaphragm material NBR, diaphragm area 46 sq-in, Steel casing.
7. Digital Valve Positioner: Digital valve controller, type DVC6200, protocal Hart 5, for I-P converting 4-20 mA control signals to a pneumatic output signal. Unit is intended for direct mounting on valve assembly and shall include a digital LCD display with adjustable tuning parameters. Positioner air capacity at 58 psig is 338 scfh.
8. Performance: Valve sized for 20 psi DP at nominal 50 gpm, inlet temperature 350 degrees F. and inlet pressure 350 psi. Maximum flow rating 80.5 gpm, CV-17.0, 99% stem rise; minimum flow 3.7 gpm, CV-0.8, 10% stem rise.
9. Valve assembly: Manufactured by Fisher Controls International, Emerson, Automations Solutions, with the following factory mounted components:
   Valve Body Model # ET-76-71595.
   Actuator Model # 667-39-3841836.
   Positioner Model # DVC-3793-4346221.
   Factory mount Model # MTG-3806-4345125

F. Pneumatic System Components
   1. Air Compressor
      Acceptable manufacturers
         Quincy
         Champion
         Ingersoll Rand
      Quincy Model QC00503D or approved equal, tank mount duplex compressor, 0.5 hp, 30 gallon tank with model QIFD factory mounted refrigerated dryer, dryer bypass line, ASME rated tank and relief valve, 70-90 psi lead pressure switch, 60-80 psi lag pressure switch.
      Provide with magnetic starter, automatic drain, combination filter/silencer, particulate filter,.01 micron QIFC coalescing filter, isolation pad and springs.
      Piping 1/2" and over to be Schedule 40 galvanized steel. Piping under 1/2" to be copper.
      Valves to be brass/bronze ball valves, 350 WOG, two piece body, type 316 stainless steel trim, TFE seats, blowout proof stem.
      Provide all pneumatic piping and valving required to interconnect the control air compressor with the following:
         High Temperature Hot Water Control Valves serving the Heating Hot Water Heat Exchangers
      Coordinate the compressed air pressure requirements of the pneumatic control valves serving the heating hot water heat exchangers with the manufacturer's requirements. If the required operating pressures differ between control

valves, the Contractor shall provide separate pressure regulators and pneumatic branch tubing for each type of control valve.

G. Binary Temperature Devices
   1. Line-voltage space thermostat:
      Line-voltage thermostats shall be bimetal-actuated, snap acting SPDT contact, enclosed, UL listed for electrical rating. The thermostat cover shall provide exposed set point adjustment knob. The thermostat shall operate within the 55°F to 85°F setpoint range, with 2°F maximum differential.
   2. Low-temperature safety thermostat:
      Low-limit air stream thermostats shall be UL listed, vapor pressure type, with a sensing element of 20 ft. minimum length. Element shall respond to the lowest temperature sensed by any 1 ft. section. The low-limit thermostat shall be automatic reset, SPDT type.
   3. Aquastat:
      Strap-on type thermostats shall be provided for low or high temperature limit service on hot water or steam condensate pipes. The thermostats shall be UL listed, with a liquid-filled bulb type sensing element and capillary tubing. The thermostat shall operate within the 20°F to 120°F, or 100°F to 240°F, setpoint range, with an adjustable 6°F differential.
      The low-limit thermostat shall be automatic reset, snap acting SPDT type with concealed set point adjustment.

H. Temperature Sensors (FIELD PANEL)
   1. Provide the following instrumentation as required by the monitoring, control and optimization functions. All temperature sensor shall use platinum RTD elements only, nickel or silicon are not acceptable.
   2. Room Temperature:
      Temperature monitoring range+40/+90 F (+40/120 F for high temp alarms)
      1K ohm RTD's
      Installation adjustmentsnone required
      Factory calibration point70 deg F
      Accuracy at calibration point+0.5 F
   3. Liquid Immersion Temperature (200 degree F. Hot Water)
      Temperature monitoring range+20/+120 F or +70/+220 F
      1k ohm RTDs
      Installation adjustment none required
      Factory calibration point70 deg F
      Accuracy at calibration point+0.5 F
   4. Liquid Immersion Temperature (400 degree F. High Temperature Hot Water)
      Temperature monitoring range+20/+400 F
      1k ohm RTDs
      Provide 316 SS high temperature thermowell
      Installation adjustment none required
      Factory calibration point 300 deg F
      Accuracy at calibration point+0.5 F
   5. Duct (Single Point) Temperature
      Temperature monitoring range+20/+120 F
      1k ohm RTDs
      Installation adjustmentsnone required

Factory calibration point70 deg F
Accuracy at calibration point+0.5 F

6. Duct (Averaging) Temperature
   Temperature monitoring range+20/+120 F
   1k ohm RTDs
   Installation adjustmentsnone required
   Factory calibration point70 deg F
   Accuracy at calibration point+0.5 F
7. Outside Air Temperature
   Temperature monitoring range-50/+122
   1k ohm RTDs
   Installation adjustmentsnone required
   Factory calibration point70 deg F
   Accuracy at calibration point+0.5 F

I. Humidity sensors
   1. Outside Air Relative Humidity
      monitoring range-12% to 99% RH
      Output signal4-20 mA
      Factory calibration
      Accuracy +2% RH
   2. Room/duct Relative Humidity
      Sensor Humidity range0 to 100%
      Operating temperature15 F to +170 F
      Accuracy+2% RH
      Sensing element Capacitive sensor
      Output signal4-20 mA DC
      Factory calibrated
      Operating temperature15 F to +170 F
      Voltage requirement12-36 VDC
      Siemens Model QFM or QFA Series

J. Pressure Sensors
   1. Air Static Pressure Sensor
      Duct Static range-.5 to + 5"wg
      Accuracy+.05" w.g.
      Output signal4 - 20 mA
      Senva Model 264 Series

K. Water Differential Pressure Sensor
   1. Transducer shall have linear output signal. Zero and span shall be field adjustable.
   2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.
   3. Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and block and bleed valves.
   4. Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Overrange limit (differential pressure) and maximum static pressure shall be 300 psi. Transducer shall be

complete with 4 to 20 mA output, required mounting brackets, and three valve manifold. Senva Model 230 Series

5. Provide differential pressure sensors for all differential pressure bypass valves. Sensor shall be factory calibrated for operating range and rated for system pressure. Provide manufacturers standard 316 stainless steel, 3 valve manifold and pressure gauges for supply and return pressures. Output shall be 4-20 ma. Senva Model 230 Series

L. Differential Pressure Switches

1. Air Differential Pressure Switch

Differential pressure switches shall be diaphragm type, with die-cast aluminum housing and adjustable set point. Switch rating shall be a minimum 5 amps at 120 VAC. Switches shall be SPDT and be used for fan status as specified in the point schedule. Switch pressure range shall be suited for application. (e.g. filter 0-2.0", fan status 0-5.0", etc.)

M. Liquid flow switch

1. Thermal dispertion type flow switch, no moving parts. Used to prove flow. .
2. Sensing elements contsructed from 316L stainless steel materials, unit is rated at -40 to 350 Degrees F.
3. Input power 115 VAC, with dual SPDT switche connections. Size unit sensor heater to match flow and pipe size conditions.
4. Unit as manufactured by FCI Fluid Components International LLC, or approved equal; model FLT93S.

N. Liquid Detection Switch

1. Point leak detection sensor, adjustable probe height.
2. Mount to floor or basin where high level leak detection will occur. operating temperature 50 to 104 degree F. NEMA 1 enclosure adjustable floor mounting bracket; provide any supplemental brackets required.
3. Input power, 24 VAC, output relays (2) form C rated at 3A at 24 VAC.
4. Unit as manufactured by Emerson, Libert; model LT-410

O. Relays

1. Control relays shall be UL listed plug-in type with dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable ±200% (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

P. Voltage Transformers

1. AC voltage transformers shall be UL/CSA Recognized, 600 VAC rated, complete with built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4°C to 55°C (40°F to 130°F) and shall provide ±0.5% accuracy at 24 VAC and a 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.

Q. Wall Push Button
   1. Momentary push button assembly, Industrial type metal bezel, 22 mm size, non illuminated operator with black cap, with (1) N.O. contact block with screw clamps terminal connections.
   2. Furnish with stainless steel cover plate, for use on standard flush back box.
   3. Provide custom legend place to read "EF-6 Start"
   4. Push button shall be based on Sq-D Class 9001 Type XB4BA21

R. Digital Energy Monitors
   1. Refer to specification section 230519
   2. Provide electric consumption meters where shown on the drawings or called for in the Project Specifications.
   3. Manufacturer:
      Siemens MD Model Energy Meter
      Siemens current transformers
   4. Meters shall provide real-time electric energy measurement.
      Voltage: 80 to 600V
      Choice of 3-phase or single phase from same unit
      Parameter update rate of 0.5 seconds
      Outputs: 2 pulse, configurable
      Waveform Sampling: 12kHz voltage and current
      UL listed Standard 61010-1, cUL certified to CAN/CSA Standard C22.2 No. 61010-1 and CE Low Voltage and EMC Directives
      Testing: ANSI C12.20-2010
      Accuracy: ANSI C12.20-2010 Class 0.2. Where differences exist between the requirements of this Standard and C12.1 and C12.10, the requirements of this Standard shall prevail.
      Resolution: 0.01 Amp, 0.1 Volt, 0.01 watt, 0.01 VAR, 0.01 VA, 0.01 Power Factor depending on scalar setting
      Power types: Single Phase, Three Phase-Four Wire (WYE), Three Phase-Three Wire (Delta)
      3 voltage channels: 80 to 346V AC Line-to-Neutral, 600V Line-to-Line, CAT III
      Maximum current input: 666 mVac (200% of current transducer rating)
      Measurement rating: True RMS using high-speed digital signal processing (DSP)
      Waveform sampling: 12 kHz voltage and current
   5. Current Transformers
      Meters shall be provided with CTs as a system such that the CTs are tested and known to be compatible with the meter.
      All current transformers shall be internally shunted for intrinsically safe operation on energized conductors.
      Output: 333 mV at rated current
      Up to 5000A service
      The meter shall accept Rogowski type CTs - flexible rope type CTs to wrap around multiple conductors or bus bars.
      The meter shall have embedded Rogowski Coil CT amplifier/integrator circuitry, so there is no need to provide external power to the CTs.
      The meter shall accept mix and match split-core and Rogowski-style CT's on the same meter.
   6. Power: Power for the meter shall be sourced from the metered lines.

Meters powered from the metered lines are allowed to be mounted inside the power panel as long as the meter is rated for the maximum voltage of the panel.

Separate low voltage power wires shall not be allowed inside of a high voltage (>240V) enclosure. Meters that require separate power supplies shall be mounted outside of the high switch panels with provisions to separate the metered lines and the meter power input wires.

Provide 0.5A fuse protection on the power to the meter.

7. Installation:

Provide a means for the installer to check that the wiring is correct without using the setup software or using the meter's built-in setup configuration. The MD Model uses LEDs to let the installer know that the wiring is correct or not.

The meter shall automatically adjust for CT orientation-greatly reducing setup time and all but eliminating installation errors.

8. Communication:

Provide an RS-485 communication connection. The unit's default communication shall be BACnet MS/TP communication.

The Meter shall be BACnet Testing Labs (BTL) certified as a smart sensor (B-SS) device.

Baud rate: 78,500

The meter shall provide ¼ unit loads on the RS485 so that up to 127 meters may be connected to a single BACnet client for monitoring and recording power usage at multiple locations within a single site. Meters with ½ units loads shall be limited to 64 meters on a subnetwork.

Modbus shall be an option only if the manufacturer of the meter provides a BACnet gateway to translate to the BAS native communication protocol.

If Ethernet networking is an option on the meter, then the BACnet implementation shall be BACnet/IP. Modbus over Ethernet shall be an option only if the meter provides a BACnet gateway to translate to the BAS native communication protocol.

9. Diagnostics

Minimum Data Monitoring:

- Total Net True Energy (kWh)
- Instantaneous Total True Power (kW)
- Peak Demand (adjustable window) (kW)
- Maximum Instantaneous Power (kW)
- Minimum Instantaneous Power (kW)
- Total Net Reactive Energy (kVARh)
- Total Reactive Power (kVAR)
- Total Apparent Energy (kVAh)
- Total Apparent Power (kVA)
- System Displacement Power Factor (dPF)
- System Apparent Power Factor (aPF)
- Total Current in all phases (Amps)
- Average Line-Line Voltage (Volts)
- Average Line-Neutral Voltage (Volts)
- Individual Phase-Phase Voltages
- Line Frequency (Hz)
- Individual Phases True Energy (kWh)
- Individual Phases True Power (kW)
- Individual Phases Reactive Energy (kVARh)

Individual Phases Apparent Energy (kVAh)
Individual Phases Reactive Power (kVAR)
Individual Phases Apparent Power (kVA)
Individual Phases Apparent Power Factor (aPF)
Individual Phases Displacement Power Factor (dPF)
Individual Phases Current (Amps)
Individual Phases Line to Neutral Voltages (Volts)
Individual Phases Line to Line Voltages (Volts)
Multiple Meters External Data Synchronization

10. Software
Provide Window compatible software with USB cable to configure the meter and interrogate the data in the meter.

S. Additional Meters - Water, High Temperature Hot Water and Natural Gas
1. Refer to specification section 230519 for additional BMS Contractor requirements.
2. Coordinate all interconnection, controls and monitoring requirements with Division 22 and 23.

T. Current Switches
1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

U. Uninterruptible Power Supplies
1. UPS's shall be installed on all building controllers.
2. Manufacturer: Functional Devices, Model PSH850-UPS-STAT.

2.9. COMMUNICATION AND CONTROL WIRING

A. Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 26 unless otherwise noted herein.
1. All insulated wire to be copper conductors, UL labeled for 90°C minimum service.
Wire Sizing and Insulation
2. Wiring shall comply with minimum wire size and insulation based on services listed below:
ServiceMinimum Gage/TypeInsulation Class
AC 24V Power 12 Ga stranded 600 Volt
DC 24V Power 10 Ga stranded 600 Volt
Class 1 14 Ga Stranded 600 Volt
Class 2 18 Ga Stranded 300 Volt
Class 3 18 Ga Stranded 300 Volt
3. Power Wiring:
115V power circuit wiring above 100 feet distance shall use minimum 10 gage.
4. 24V control power wiring above 200 feet distance shall use minimum 12 gage.
Control Wiring:
Digital Input/Output wiring shall use Class 2 twisted pair, insulated.
Analog inputs shall use Class 2 twisted shielded pair, insulated and jacketed and require a grounded shield.
Actuators with tri-state control shall use 3 conductor with same characteristics

5. Communication Wiring
   Ethernet Cable shall be minimum CAT5
   Secondary level network shall be 24 gage, TSP, low capacitance cable

PART 3 - EXECUTION

3.1. EXAMINATION:

A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.

B. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.

C. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate-or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others-the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others.

3.2. PROTECTION

A. The contractor shall protect all work and material from damage by its employees and/or subcontractors and shall be liable for all damage thus caused.

B. The contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted.

3.3. COORDINATION

A. Site
   1. The project coordination between trades is the responsibility of the prime contractor who is the one tier higher contractual partner such as mechanical contractor, general contractor, construction manager, owner or owner's representative as applicable.
   2. The controls contractor shall follow prime contractor's job schedule and coordinate all project related activities through the prime contactor except otherwise agreed or in minor job site issues. Reasonable judgment shall be applied.
   3. Where the work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment.
   4. If the contractor deviates form the job schedule and installs work without coordinating with other trades, so as to cause interference with work of other

trades, the contractor shall make the necessary changes to correct the condition without extra charge.

5. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.

B. Test and Balance
   1. The contractor shall coordinate with the TAB contractor as necessary for the proper start-up of associated HVAC equipment

C. Life Safety
   1. All Life Safety functions (i.e. HVAC equipment shutdowns) shall be the full responsibility of the Fire Alarm Contractor. The DDC system shall monitor general fire alarm input from the FA system in order to perform a soft-restart of the affected HVAC equipment after a return to normal.
   2. All associated Life Safety devices (i.e. smoke detectors) shall be furnished and wired by Division 26. Installation of these devices shall be by the Mechanical Contractor.

D. Coordination with controls specified in other sections or divisions.
   1. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
      All communication media and equipment shall be provided as specified in Part 2, "Communication" of this specification.
      Each supplier of controls product is responsible for the configuration, programming, startup, and testing of that product to meet the sequences of operation described in this section.
      The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.
      The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
      The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.4. GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

F. Wiring ran inside Fin Tube Enclosures shall be ran inside EMT to within two feet of the equipment/device being controlled.

3.5. FIELD QUALITY CONTROL

A. Contractor shall have a quality manager on staff to inspect the project execution and to enforce quality standards.

B. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this specification.

C. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.

3.6. PNEUMATICS

A. Install the pneumatic control air system including but not limited to the air compressor, filters, dryer, valves, drains and tubing for a complete and opeational system.

B. Provide all pneumatic piping, valving, tranducers, etc required to interconnect the control air compressor with the following for a complete and operational system:
   1. High Temperature Hot Water Control Valves serving the Heating Hot Water Heat Exchangers

3.7. WIRING

A. The BMS Contractor shall be responsible for all electrical work associated with the BMS.
   1. Provide extension of 120 volt, 20 amp circuit for all BMS equipment power. Dedicated circuit breaker shall be provided by Division 26. Emergency Power shall be used where specified. Provide and install local UPS Power supply for all BMS system panels. UPS power is not required for terminal equipment ASC's.
   2. Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC Controllers and operator's workstations.
   3. Provide all miscellaneous field device mounting and interconnecting wiring for all mechanical systems.
   4. All systems requiring interlock wiring shall be hardwired interlocked and shall not rely on the BMS to operate (e.g. emergency generator to fuel oil pump interlock,

emergency generator damper interlock, etc.) Interlock wiring shall be run in separate conduits from BMS associated wiring.

B. All control and interlock wiring shall comply with national and local electrical codes and Division 26 of this specification.

C. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved conduit according to NEC and Division 26 requirements.

D. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub fused when required to meet Class 2 current limit.)

E. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums and possibly crawlspaces, approved cables not in conduit may be used provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenums shall be UL Listed specifically for that purpose.

F. All wiring in mechanical, electrical, or service rooms-or where subject to mechanical damage- shall be installed in conduit.

G. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

H. Do not install wiring in conduit containing tubing.

I. All wire-to-device connections shall be made at a terminal block or wire nut. All wire-to-wire connections shall be at a terminal strip or wire nut.

J. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

K. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers or interposing relays.

L. All wiring in conduit shall be installed as continuous lengths, with no splices permitted between termination points or junction boxes.

M. Maintain fire rating at all penetrations. Install plenum wiring in sleeves where it passes through walls and floors.

N. Size and type of conduit and size and type of wire shall be the responsibility of the contractor, in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.

O. Include one pull string in each conduit 3/4 in. or larger on runs exceeding 100' in length.

P. Conceal all conduits, except within mechanical, electrical, or service rooms. Install conduit to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g., steam pipes or flues).

Q. Secure conduit with conduit clamps fastened to the structure and spaced according to code requirements. Conduit and pull boxes may not be hung on flexible duct strap or tie rods. Conduits may not be run on or attached to ductwork. Class 2 control wiring (and/or device controllers) may be installed directly to ductwork in the absence of readily available supporting means.

R. Adhere to this specification's Division 26 requirements where conduit crosses building expansion joints.

S. The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

T. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 1 m (3 ft) in length. Flexible metal conduit less than 3/8 in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.

U. Conduit must be adequately supported, properly reamed at both ends, and left clean and free of obstructions. Conduit sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.8. COMMUNICATION WIRING

A. The contractor shall adhere to the items listed in the “Wiring” article in Part 3 of the specification.

B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

C. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

D. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

E. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.

F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to the manufacturer's instructions.

G. All runs of communication wiring shall be unspliced length when that length is commercially available.

H. All communication wiring shall be labeled to indicate origination and destination data.

I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

J. Division 26 to provide two communication connection points (one in basement and one in attic) for use by the BMS. Coordinate final location of drops with Division 26 contractor. If additional communication connection points are required, they shall be provided under the BMS contract.

3.9. INSTALLATION OF SENSORS

A. General:
   1. Install sensors in accordance with the manufacturer's recommendations.
   2. Mount sensors rigidly and adequately for the environment within which the sensor operates.
   3. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
   4. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.
   5. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type.
   6. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across the full face of the coil.
   7. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.
   8. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.

B. Room Instrument Mounting
   1. Room instruments, including but not limited to wall mounted thermostats and sensors located in occupied spaces shall be mounted 53 inches above the floor. Instruments shall be installed 48" above the floor in ADa accessible rooms.

C. Instrumentation Installed in Piping Systems
   1. Thermometers and temperature sensing elements installed in liquid systems shall be installed in thermowells.
   2. Gauges in piping systems subject to pulsation shall have snubbers.
   3. Gauges for steam service shall have pigtail fittings with isolation valve.

D. Temperature Limit Switch
   1. A temperature limit switch (Low Temperature Detector) shall be provided to sense the temperature.
   2. A sufficient number of temperature limit switches shall be installed to provide complete coverage of the duct section.
   3. Manual reset limit switches shall be installed in approved, accessible locations where they can be reset easily.
   4. The temperature limit switch sensing element shall be installed in a serpentine pattern and in accordance with the manufacturer's installation instructions.
   5. Each bend shall be supported with a capillary clip. Provide 3 m of sensing element for each 1 m2 (1 ft of sensing element for each 1 ft2) of coil area.

E. Averaging Temperature Sensing Elements
   1. Sensing elements shall be installed in a serpentine pattern.
   2. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.

F. Water Differential Pressure Sensors
   1. Differential pressure sensors shall be installed with valved taps into the piping to ensure serviceability without draining the system
   2. Sensors shall be mounted with bleed valves
   3. After sensor installation any air shall be eliminated using the bleed valves to ensure reading accuracy
   4. The sensors shall be located to ensure accessibility

G. Relative Humidity Sensors
   1. Relative humidity sensors in supply air ducts shall be installed at least 3m (10 feet) downstream of humidity injection elements.

H. Flowmeters
   1. The minimum straight unobstructed piping for the flowmeter installation shall be at least 10 pipe diameters upstream and at least 5 pipe diameters downstream and/or in accordance with the manufacturer's installation instructions.

3.10. ACTUATORS

A. Mount and link control damper actuators according to manufacturer's instructions.
   1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
   2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

B. Provide all mounting hardware and linkages for actuator installation.
   1. Electric/Electronic
      Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the

actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.

Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

C. Pneumatic
   1. Valves: Factory matched pneumatic actuators. Provide in accordance with manufacturers recommendations.

3.11. WIRING LABELS AND IDENTIFICATION TAGS

A. Equipment and Device labeling:
   1. Labels and tags shall be keyed to the unique identifiers shown on the As-Built drawings.
   2. All Enclosures/DDC Building Controllers shall be labeled, identifying control panel number and circuit breaker that provides power (identify both electric panel and circuit breaker).
   3. Labels exterior to protective enclosures shall be engraved plastic and mechanically attached to the enclosure or DDC Hardware.
   4. Labels inside protective enclosures may be attached using adhesive, but shall not be hand written.
   5. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.
   6. All wiring and cabling including that within factory-fabricated panels shall be labeled within 5 cm (2 in.) of termination with the DDC address or termination number.

3.12. PROGRAMMING

A. Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free within the primary controller for future use.

B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index. Point Naming standard shall be agreed upon between owner and BAS contractor. Refer to Submittals section in the General Section.

C. Software Programming
   1. Provide programming for the system and adhere to the sequences of operation provided. The contractor also shall provide all other system programming necessary for the operation of the system, but not specified in this document. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation and be of different font and color in text editor. Use the appropriate technique based on one of the following programming types:

Text-based:
Must provide actions for all possible situations
Must be modular and structured
Must be commented
Must provide line by line programming and compilation wizard to allow for ease of editing.
Graphic-based:
Must provide actions for all possible situations
Must provide programming and compilation wizard to allow for ease of editing.
Must be documented

D. Operator Interface
1. Standard graphics-Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as set points.
2. Show terminal equipment information on a "graphic" summary table. Provide dynamic information for each point shown.
3. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.
4. Contractor shall provide necessary programming to create all reports referred to in Part 2 Operator Interface Software.

3.13. LOOP TUNING

A. Perform all tuning for PID parameters for all required control loops and all control outputs.

B. Contractor shall perform tuning at time (of weather conditions and season, i.e. late summer) of installation completion. Contractor shall return to site to repeat loop tuning approximately 6 months after installation completion, in order to verify system operation in winter weather conditions.

3.14. SYSTEM COMMISSIONING

A. Perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning and integrated system program commissioning. Document all commissioning information on commissioning data sheets that shall be submitted prior to acceptance testing. Commissioning work that requires shutdown of system or deviation from normal function shall be performed when the operation of the system is not required. The commissioning must be coordinated with the owner and construction manager to ensure systems are available when needed. Notify the operating personal in writing of the testing schedule so that authorized personnel from

the owner and construction manager are present throughout the commissioning procedure.

B. Phase I - Field I/O Calibration and Commissioning
   1. Verify that each control panel has been installed according to plans, specifications and approved shop drawings. Calibrate, test, and have signed off each control sensor and device. Commissioning to include, but not be limited to:
      Sensor accuracy at normal operating conditions.
      Sensor range.
      Verify analog limit and binary alarm reporting.
      Point value reporting.
      Binary alarm and switch settings.
      Fail safe operation on loss of control signal, pneumatic air, electric power, network communications, etc.

C. Phase II - System Commissioning
   1. Each BMS program shall be put on line and commissioned. The contractor shall, in the presence of the owner and construction manager, demonstrate each programmed sequence of operation and compare the results in writing. In addition, each control loop shall be tested to verify proper response and stable control, within specified accuracy. System program test results shall be recorded on commissioning data sheets and submitted for record. Any discrepancies between the specification and the actual performance will be immediately rectified and re-tested.

D. Phase III - Integrated System Program Commissioning
   1. Tests shall include, but not be limited to:
      Data communication, both normal and failure modes.
      Fully loaded system response time.
      Impact of component failures on system performance and system operation.
      Time/Date changes.
      End of month/ end of year operation.
      Season changeover.
      Global application programs and point sharing.
      System backup and reloading.
      System status displays.
      Diagnostic functions.
      Power failure routines.
      Battery backup.
      Testing of all electrical and HVAC systems with other division of work.
      Year 2000 compliance test.
   2. Submit for approval, a detailed acceptance test procedure designed to demonstrate compliance with contractual requirements. This Acceptance test procedure will take place after the commissioning procedure but before final acceptance, to verify that sensors and control devices maintain specified accuracy and the system performance does not degrade over time.
   3. Using the commissioning test data sheets, the contractor shall demonstrate each point. The contractor shall also demonstrate 100 percent of the system functions. The contractor shall demonstrate all points and system functions until all devices and functions meet specification.

4. After the above tests are complete and the system is demonstrated to be functioning as specified, a thirty-day performance test period shall begin. If the system performs as specified throughout the test period, requiring only routine maintenance, the system shall be accepted. If the system fails during the test, and cannot be fully corrected within eight hours, the owner may request that performance tests be repeated.

3.15. DEMONSTRATION AND ACCEPTANCE

A. Demonstration
   1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
   2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" article in Part 3 of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
   3. The demonstration process shall follow that approved in Part 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
   4. The contractor shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.
   5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
   6. Demonstrate compliance with Part 1, "System Performance."
   7. Demonstrate compliance with sequences of operation through all modes of operation.
   8. Demonstrate complete operation of operator interface.
   9. Additionally, the following items shall be demonstrated:

      DDC control loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC control loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.

      Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.

      Interface to the building fire alarm system.

Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and electronic formats.

Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

10. Acceptance

All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.

The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, "Submittals."

3.16. CLEANING

A. The contractor shall clean up all debris resulting from their activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.

C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.17. TRAINING

A. The Contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed. Factory employed/certified instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 8:00 a.m. to 4:30 p.m. weekdays.

B. Provide 16 hours of site specific training for Owner's operating personnel. Training shall include:

1. Day-to-day Operators:
   Proficiently operate the system

Understand control system architecture and configuration
Understand DDC system components
Understand system operation, including DDC system control and optimizing routines (algorithms)
Operate the workstation and peripherals
Log on and off the system
Access graphics, point reports, and logs
Adjust and change system set points, time schedules, and holiday schedules
Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
Understand system drawings and Operation and Maintenance manual
Understand the job layout and location of control components
Access data from DDC controllers and ASCs
Operate portable operator's terminals

END OF SECTION

SECTION 230993
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation for:
   1. Cabinet Heaters.
   2. Energy recovery units.
   3. Electrical rooms .
   4. Elevator & machine rooms.
   5. Emergency generators.
   6. Heating Coils.
   7. Laundry Ventilation System.
   8. Hot water radiation.
   9. Air to air heat exchangers.
   10. Water to water heat exchangers.
   11. Heating hot water pumps.
   12. Heating glycol pumps.
   13. Split system heat pumps and air conditioning systems.
   14. Radiant heating system.
   15. Glycol feed system.
   16. Fans

1.2 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.3 SUBMITTALS

A. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
   1. Include at least the following sequences:
      a. Start-up.
      b. Warm-up mode.
      c. Normal operating mode.
      d. Unoccupied mode.
      e. Capacity control sequences and equipment staging.
      f. Temperature and pressure control, such as setbacks, setups, resets, etc.
      g. Effects of power or equipment failure with all standby component functions.
      h. Sequences for all alarms and emergency shut downs.
      i. Seasonal operational differences and recommendations.
      j. Interactions and interlocks with other systems.

B. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
   1. Label with settings, adjustable range of control and limits.
   2. Include flow diagrams for each control system, graphically depicting control logic.

3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.

C. Points List: Submit list of all control points indicating at least the following for each point.
   1. Name of controlled system.
   2. Point abbreviation.
   3. Point description; such as dry bulb temperature, airflow, etc.
   4. Display unit.
   5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
   6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
   7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
   8. Calculated point (Yes / No); i.e. a "virtual" point generated from calculations of other point values.

D. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 HYDRONIC RADIANT HEAT (P7).

A. Radiant heat system is controlled by an applications specific controler with electric actuation with a space temperature sensor coupled with the radiant heat circulating pump P7 and a 3- way modulating control valve located in the basement mechanical room.

B. Monitor radiant system supply and return water temperature, alarm if supply water temperature is out of limits; i.e. if it drops below setpoint and if it exceeds setpoint (adj.) initial setting 120 degree F.

C. The pump shall run continuously when outside air temperatures are at or below 38 degrees (adj.).

D. Pump status: If the pump is commanded on, alarm to building operator if pump fails.

E. Upon a call for heat from the space temperature sensor, the pump shall energize (unless already energized per 3.1, B) and the control valve shall modulate as required to maintain the hot water supply temperature setpoint - 120 degrees (adj.)

F. Once the room temperature sensor is satisfied, the control valve shall close and pump shall turn off (unless energized per 3.1, B).

G. The DDC controls shall include a system lock-out to prohibit system operation when outside air temperature is above 60 degrees (adj.).

3.2 FIN TUBE RADIATION (F1)(F3):

A. The fin tube radiation is controlled by an application specific DDC controller using electric actuation. The space served by the radiation is controlled in Occupied and Unoccupied modes as follows:
   1. Occupied: The controller monitors the room temperature sensor and modulates the 2-way valve to maintain the space temperature set point.

2. Unoccupied: The radiation is controlled using the Unoccupied space temperature set point. The controller may reset to the Occupied mode for a predetermined time period upon a signal from the control system or manually at the room sensor.
3. Set point bias adjustment: The occupant can manually adjust the room bias set point (adj.) at the wall space sensor, up/down by 2 degrees F from the system set point.

3.3 FIN TUBE RADIATION (F2):

A. The fin tube radiation is controlled by an application specific DDC controller using electric actuation. The space served by the radiation is controlled in Occupied and Unoccupied modes as follows:
   1. Occupied: The controller monitors the room temperature sensor and modulates the 3-way valve to maintain the space temperature set point.
   2. Unoccupied: The radiation is controlled using the Unoccupied space temperature set point. The controller may reset to the Occupied mode for a predetermined time period upon a signal from the control system or manually at the room sensor.
   3. Set point bias adjustment: The occupant can manually adjust the room set point (adj.) at the wall space sensor up/down by 2 degrees F. from the system set point.

3.4 CABINET UNIT HEATERS (CH1) (CH2) (CH3) (CH4) (CH5):

A. The Cabinet Unit Heater is controlled by an application specific DDC controller using electric actuation. The space served by the heater is controlled as follows:
   1. Controller monitors the space temperature sensor and shall cycle the fan using a control relay to maintain the space temperature set point (adj.) initial setting 65 degrees F. Hot water control valve shall modulate open to maintain space sensor setpoint when fan is operating and shall be closed when fan is off.
   2. The DDC controls shall include a system lock-out to prohibit fan & coil operation when the hot water heating system is deactivated.

3.5 UNIT HEATER (UH1, UH2):

A. The Unit Heater is controlled by an application specific DDC controller using electric actuation. The space served by the heater is controlled as follows.
   1. Controller monitors the room temperature sensor and shall cycle the fan using a control relay to maintain the space temperature at set point (adj.). Unit heaters are not equipped with a hot water control valve. Water shall run at constant flow thru unit with fan control only.
   2. The DDC controls shall include a system lock-out to prohibit fan operation when the hot water heating system is deactivated.

3.6 METERING INTERFACES:

A. BAS shall monitor read and record all energy meter data streams as listed below. This information shall be recorded and be available to campus building operators.

B. Meter information shall be configured as flow rate and flow totalization data streams. Data shall be recorded and stored on operator station server platform. See appendix B for meter and other data stream retention requirements.

C. High Temperature Hot Water Meter shall communicate with BACnet protocal.

D. Energy Meter Interfaces; Monitor and record information from the following devices:
   1. Electric power meter.
   2. Potable water meter.
   3. Natural gas meter.
   4. High Temperature BTU and flow meter.

3.7 HEATING COILS (HC1 & HC2):

A. For heating coil HC1, see small energy recovery unit ERU3 description.

B. For heating coil HC2, see laundry system description.

3.8 HIGH TEMPERATURE HOT WATER SERVICE ENTRANCE:

A. Immersion temperature sensors: The high temperature hot water supply and return shall include specialty high temperature immersion temperature sensors that report HTHW supply and return temperatures to the BMS. These sensors are separate from the HTHW BTU meter system.

B. HTHW Bypass Control Valve: The high temperature hot water bypass valve shall modulate to maintain a minimum high temperature hot water supply temperature setpoint of 275 (adj.) as measured by the high temperature hot water supply immersion temperature sensor.

1. The BMS shall have the ability to enable and disable the bypass valve sequence noted above. During periods when the high temperature hot water system is shut down, the bypass valve sequence shall be disabled.

C. The high temperature hot water supply shall include a flow meter that measures temperature and flow. The BMS shall read flow (gpm) and energy use (BTU) through the flow meter.

D. Alarms:

1. High high temperature hot water supply
2. Low high temperature hot water supply
3. High high temperature hot water return
4. Low high temperature hot water return

3.9 SHELL AND TUBE HEAT EXCHANGERS (HE1)(HE2):

A. The heating system enable point is controlled either manually by the operator or by a program function (i.e., Time-Of-Day). Each heat exchanger is to be provided with one high temperature hot water control valve, sized for minimum flow at 10% stem rise.

B. If the heating system enable point is ON and the outdoor air temperature is below 65 degrees F (adj.), the HTHW control valve shall open and shall modulate to maintain the shell side heating hot water outlet temperature setpoint (see outdoor air reset schedule below).

C. Should the lead control valve fail to maintain the hot water outlet temperature setpoint for at least 5 minutes (adj.) the lag heat exchanger HTHW control valve shall be enabled and shall modulate open as required to maintain the hot water outlet temperature setpoint.

D. Once setpoint is reached, the valves shall modulate as required to maintain setpoint. If the heating hot water outlet temperature exceeds setpoint, the HTHW control valves shall begin to modulate closed in the reverse order of that described above until setpoint is maintained.

E. In addition, the shell and tube heat exchangers HE1 and HE2 are 100% redundant, and shall operate in a lead-lag fashion, with manual override available to accommodate servicing. In automatic mode, unit selected to be lead unit shall operate for a period of four hours, with the lag unit operating for the next four hours. Time shall be adjustable from 2-48 hours with overrides as noted.

F. Outdoor air reset shall be provided to allow for lower shell side leaving hot water temperatures (LWT) based on outdoor air temperature (OAT). Reset schedule as follows (all setpoints to be adjustable):

1. OAT = 40-50 degrees F, LWT = 100 degrees F
2. OAT = 30-40 degrees F., LWT = 130 degrees F
3. OAT = 20-30 degrees F., LWT = 150 degrees F
4. OAT = 10-20 degrees F., LWT = 170 degrees F
5. OAT < 10 degrees F., LWT = 190 degrees F

G. Alarms:
1. High secondary hot water supply
2. Low secondary hot water supply
3. High secondary hot water return
4. Low secondary hot water return

H. Over temperature safety hard wired lockout
1. For each heat exchanger, when high temperature limit sensor exceeds setpoint, a hard wired system with high capacity air switching valve shall shut down pneumatic system signal closing the control valve. Insure air switching valves have required air flow capacity to quickly limit operation of all heat exchanger control valves (standard EP switches are not acceptable).

3.10 HEATING GLYCOLHOT WATER PUMPS (P1, P2 AND P3):

A. Each heating water pump will be controlled by a variable frequency drive tied to the central BMS system. Pumps are sized for 50% load each. Pumps shall run in lead-lag fashion, with only two pumps required to run at one time. Lead-lag selection and pump selection to be changeable from the operator workstation graphical user interface without additional programming. The BMS system shall also allow for override of any pump to allow for servicing.

B. The system operates as follows (All set points and settings are adjustable.):
1. Upon a call for heat from any zone, the first pump shall energize. The variable frequency drive modulates the first pump speed to maintain a minimum system differential pressure of 10 PSI (adj.) at each of the two differential pressure sensors. Pump shall ramp up as required to maintain pressure.

C. Should load continue to increase, the second pump shall energize. When both pumps are operational, they shall ramp up and down at equal RPM/Hertz as required to satisfy pressure differential.

D. As load is satisfied, pumps shall ramp down and shutdown in reverse order until all loads are satisfied.

E. Pumps shall be automatically assigned lead, lag or off duty though the BMS system at weekly intervals (adj.).

F. Alarms
1. Pump commanded ON but proof of operation via current sensor indicates pump is not operating.
2. VFD alarm
3. High differential pressure sensed
4. Low differential pressure sensed

3.11 ATTIC MECHANICAL ROOM (EF3)

A. Monitor the space temperature flat plate sensor. The DDC system shall open the exhaust air damper and the intake air damper and cycle exhaust fan EF3 to maintain the space temperature at set point (adj.) initial setting 75 degree F .

B. Exhaust fan and outside air intake dampers shall operate continuously when mechanical room temperature is above setpoint.

C. Exhaust fan and outside air dampers shall turn off & close when mechanical room temperature is below 60 degrees F.

3.12 STAIR 3 (S3-5) ATTIC LEVEL

A. Monitor space temperature flat plate sensor.

B. When space temperature sensor exceeds set point (adj.) initial setting 75 degree F., open convection relief air damper to allow hot space air to relieve outdoors via convection thru motorized air damper.

3.13 LAUNDRY VENTILATION SYSTEM (EF2, HC2 & P4):

A. The Laundry Ventilation System consists of an outside air damper, a heating coil (HC2) with modulating control valve and an exhaust fan (EF2). Additionally, each dryer electrical circuit shall be provided with a current sensor and a relay. The exhaust fan is controlled by a variable frequency drive.

B. Occupied/Standby Mode: Room occupancy shall be determined by a room occupancy sensor. Upon detection of room occupancy by the occupancy sensor, the Laundry Ventilation system shall go into Occupied mode.

1. Occupied Mode:

a. The outside air damper shall open and the exhaust fan shall energize and shall slowly ramp up speed as required to maintain a slightly negative exhaust air duct pressure with respect to the laundry room. the BAS shall modulate the speed of its VFD to maintian the exhaust air duct differential pressure set point (adj.). The HC2 circulating pump shall energize and the coil control valve shall modulate to maintain the supply air temperature setpoint.

b. Fan speed control: As laundry dryers are energized, the exhaust fan shall modulate its fan speed. When dryer 1 thru 3 start, index fan VFD speed signal to min speed setpoint (adj.) initial setting 30% speed. For the next dryers activated, index fan speed for 220 cfm for each dryer; coordinate with TAB balancing sub-contract to determine exact setpoints required.

c. The Laundry System shall remain in the Occupied mode until the following conditions are met. Once the following conditions are met and a two minute delay has passed, the exhaust fan shall de-energize and the make-up air damper shall close:

1) No dryers are operational as sensed by individual dryer current sensors.

2) No occupancy within the laundry room as sensed by the room occupancy sensor.

d. Heating Coil (HC2):

1) The heating coil is controlled by an application specific DDC controller using electric actuation.

2) The controller monitors the supply air temperature sensor located down stream of the heating coil and modulates the 3 way control valve to maintain setpoint (adj.); initial setpoint shall be 72 degrees F.

3) The controller shall monitor the space temperature sensor and reset the duct sensor to maintain the space temperature setpoint (adj.);initial setpoint shall be 72 degrees F.

e. Heating Coil Pump (P4):

1) Coil Pump shall run continuously when the freeze protection setpoint (adj.) for outside air temperature is below 38 degrees F.

2) When outside air temperature is above setpoint, coil pump shall operate whenever heating coil is calling for heat. Pump shall stop when coil discharge setpoint is reached and the control valve is fully closed.

C. Safeties:
   1. If the exhaust air temperature reaches the high temperature cut-out set point (adj.) the exhaust fan shall stop, the outside air damper shall close and the power circuit to the dryers shall de-energize.
   2. A low temperature detector in the discharge of the heating coil de-energizes the exhaust fan and closes the outside air damper when temperatures falls below 45 degrees F; send an alarm to the BAS system.
   3. Fan status: Current sensors shall be used to monitor the status of the exhaust fan.
      a. If the exhaust fan is commanded to energize, and a two minute delay has passed, and the fan has not energized, the BAS shall de-energize all electrical circuits suppling the clothes dryers, de-energize the exhaust fan, close the outside air damper and send an alarm to the central BAS.
   4. Pump status: Current sensor shall be used to monitor the pump status. If the pump is commanded on and fails to operate, send an alarm to the BAS system.

3.14 SMALL ENERGY RECOVERY UNIT (ERU3, HC1):

A. The small energy recovery unit shall be provided with factory and field installed controls. Coordinate with specification section 237201 for information on factory provided and field installed controls.

B. The central BAS system shall Enable/Disable the ERU3 unit and associated outside air and exhaust dampers.

C. Unit shall operate continuously in occupied mode and be disabled when space is unoccupied.

D. External Dampers:
   1. The unit is equipped with external outside air damper, exhaust air damper, each damper includes an electrically actuated operator.
   2. When ERU3 is operational, the unit mounted controls will open the outside air and exhaust air dampers. When ERU3 is disabled, the outside air damper and exhaust air damper shall close.

E. Unit shall be equipped with internal factory installed low ambient kit for frost control.

F. Heat Wheel Frost Control:
   1. Frost control shall be by unit mounted controls based on outside air temperature, when below setpoint unit will operate factory supplied pre-heater.

G. Economizer Cycle: The BAS shall encorporate a economizer cycle to de-energize the energy recovery wheel during peroids of free cooling. The economizer cycle shall be determined by the BAS by comparing indoor air enthalpy with an outside air enthalpy sensor.

H. Heating coil (HC1):
   1. The heating coil is controlled by the ERU3 application specific DDC controller using electric actuation.
   2. When ERU3 is operating, the heating coil (HC1) shall be enabled. The controller shall monitor the supply air temperature sensor located down stream of the heating coil and modulates the 2 way control valve to maintain the supply air temperaure setpoint (adj.) initial setpoint shall be 72 degree F.
   3. The controller shall monitor the space temperatures in electric room 009 & computer room 010 and reset the duct sensor to maintain the setpoint of the computer room space.

I. Safeties:

1. A low temperature detector in the discharge of the heating coil de-energizes the supply and exhaust fans when temperatures below 38 degrees F (adj.) are sensed.
2. Current sensors shall be installed in the supply and exhaust fan starters. The BAS system shall use these sensors to confirm the fans are in the desired state (i.e. on or off) and generates an alarm if status deviates from DDC start/stop control.

3.15 ENERGY RECOVERY UNITS (ERU1 AND ERU2):

A. The energy recovery units shall be provided with factory and field installed controls. Coordinate with specification section 237201 for information on factory provided and field installed controls.

B. The energy recovery unit consists of a supply air and exhaust air section, return air and outside air filters, heat wheel, heat wheel bypass dampers, hot water heating coil and supply and exhaust fans. Additional dampers exist on the outside air and exhaust air duct prior to connection with the units.
   1. The air handling unit is scheduled through the BMS for Occupied and Unoccupied mode. During Occupied mode, the following three submodes shall occur based on outside air temperature: Occupied (Normal), Occupied (Bypass/Economizer), Occupied (Exhaust Only).
   2. The supply air temperature set point shall be 70 degrees (adj.) and is set at the central BMS.

C. Unoccupied Mode: The supply and exhaust fans are de-energized. The outside air and exhaust air dampers close. If the OAT is less than 45 degrees F (adj.), the heating coil valve opens. If the OAT is 45 degrees F (adj.) or above, the heating coil valve closes

D. Occupied (Normal): At outside air temperatures below 65 (adj.).
   1. The outside air and exhaust air dampers open. After a time delay, the supply fan and exhaust fan start and shall run continuously at the Supply Fan Normal and Exhaust Fan Normal speed setpoints. The fans do not start until the end switch is closed on the respective dampers.
   2. The heat wheel bypass dampers (supply and exhaust) shall be in full flow through the heat wheel.
   3. The coil pumps (P5 and P6) shall energize and the heating coil valve shall modulate to maintain the supply air temperature set point.

E. Occupied (Set back): At discretion of campus.
   1. The outside air and exhaust dampers open. After time delay, the supply fan and exhaust fan start and run continuously at setback mode, supply fan setback set point 50% speedand exhaust fan setback set point 50% speed. The fans do not start until the end switch is closed on the respective dampers.
   2. The heat wheel bypass dampers (supply and exhaust) shall be in full flow through the heat wheel.
   3. The coil pumps (P5 and P6) shall energize and the heating coil valve shall modulate to maintain the supply air temperature set back set point.

F. Occupied (Bypass/Economizer): At outside air temperatures between 65 (adj.) and 75 (adj.).
   1. The unit controls shall command the wheel to stop and open the wheel bypass dampers (supply and exhaust) to full wheel bypass position. The outside air and exhaust dampers shall be open.
   2. The supply fan and exhaust fan shall run continuously at the Supply Fan Bypass/Econ and Exhaust Fan Bypass/Econ speed setpoint.
   3. The coil pumps shall be de-energized and the heating coil valve shall be closed.

G. Occupied (Exhaust Only): During peroids when the outside air temperature is greater than 75 (adj.).
   1. The supply fan shall de-energize and the outside air damper shall close. The exhaust fan shall be active and the exhaust air damper shall be open.
   2. The exhaust fan shall run continuously at the Exhaust Fan Bypass/Econ speed setpoint.
   3. The heat wheel bypass dampers shall be in the full wheel bypass position.
   4. The coil pumps shall be de-energized and the heating coil valve shall be closed.

H. Heating coils (integral to ERU1, ERU2)
   1. Heating coils for each energy recovery unit are controlled by the application specific controller using electric actuation.
   2. When ERU unit is operating, the respective heating coil shall be enabled. The controller shall monitor supply air temperature sensor located unit discharge and modulate 3 way control valve to maintain supply air setpoint (adj.) initial setpoint 72 degree F.

I. Coil pumps (P5 @ ERU1, P6 @ ERU2)
   1. Enable: When outside air is above 38 degreesF. pumps shall run when ever heating coil is calling for heat based on supplr air temperature. Coil pump shall stop when coil has reached setpoint and when control valve closes.
   2. Freeze protection: Coil pumps shall run continuously when outside air temperature is below setpoint (adj.) initial setting 38 degrees F.

J. Safety
   1. Freeze protection: A low temperature freeze stat in the discharge of the heating coil de-energizes the supply and exhaust fans when supply air temperature below 38 degrees F is sensed. The heating hot water pumps shall be energized and the heating hot water coil valve shall modulate to the full open position. The outside air and exhaust air dampers shall close.
   2. Fan status: Current sensors shall be installed in the supply and exhaust fans. The BAS system shall use these sensors to confirm the fans are in the desired state (i.e. on or off).

K. Alarms
   1. Low supply air temperature
   2. High supply air temperature
   3. Low return air temperature
   4. High return air temperature
   5. Hot water coil freeze stat trip
   6. Supply fan and Exhaust fan VFD alarm
   7. Supply and return air dirty filter alarm
   8. Supply or Return fan commanded on but operation as sensed by current sensor indicates fan is not energized.
   9. Hot water coil pump is commanded on but operation as sensed by current sensor indicates that pump is not energized.
   10. Wheel commanded to rotate but operation as sensed by factory controls indicates wheel is not rotating.

L. Unit shall be equipped a factory programmed and controlled defrost cycle. During the defrost cycle, the unit will stop the rotation of the energy wheel for a preset time duration during peroids when the exhaust air leaving the energy wheel drops below a factory setpoint (factory setpoint shall be adjustable).

M. Fire Alarm: The BMS shall monitor the status of the building Fire Alarm system. When under alarm condition, the Fire Alarm will shut down the ERU (Fan Shutdown). When the alarm condition is cleared at the Fire Alarm panel, the BMS shall auto-restart the ERU system to the last mode present before the Fire Alarm Condition.

3.16 RESIDENT DIRECTOR SUITE

A. Split system heat pump systems serving the resident director apartment (ACC1, AC1, AC2).
   1. Common condensing unit ACC1 shall be energized when any indoor unit AC1 or AC2 is calling for cooling or heating.
   2. Room temperature sensors shall control AC1 and AC2.
   3. Condensing unit to shut down when both room setpoints are satisfied.
   4. These systems will have hard wired controls between factory supplied temperature sensor and all indoor and outdoor units, see appendix A I/O notes for mini split units.

B. RD Laundry Room (EF4),(WH-3 leak detection)
   1. Toilet/ washer/shower room: EF-4 shall be controlled by a wall switch (wired by EC).
   2. The exhaust fan operation shall be manually controlled by occupant.
   3. Leak sensor (located at WH-3): Monitor leak sensor, if water is detected provide alarm signal to BMS operator.

3.17 ELEVATOR & ELEVATOR MACHINE ROOM (SP-1), (LEAK DETECTION), (ACC2, AC3)

A. Monitor space temperature flat plate sensor in elevator machine room, alarm when temperature exceeds high level set point (adj.) of 80 degrees F.

B. Pump alarm: Monitor sump pump (SP-1) control panel alarm contact for pump fail, report to system operator

C. Monitor elevator shaft sump basin high water level leak detector, alarm if sump pump (SP-1) fails and basin water level exceeds high limit.

D. Split system serving elevator and elevator machine room (ACC2, AC3)
   1. Condensing unit ACC2 shall energize whenever indoor unit calls for cooling.
   2. Ducted indoor units shall be controlled by a manufacturers temperature sensor setpoint 75 degrees F. located in the elevator machine room.
   3. High Temperature alarm: Space sensor shall alarm to system operator when space exceeds 80 degrees F (adj.).
   4. Condensing unit shall shut down to shut down once temperature setpoint has been satisfied.
   5. Fan shall run continuously to condition both the elevator shaft and the machine room when building is occupied.
   6. These systems will have hard wired controls between factory supplied temperature sensor and all indoor and outdoor units, see appendix A I/O notes for mini split units.

3.18 GLYCOL FEED SYSTEM

A. Glycol feed system pump shall be energized as signalled by integral feed system controls upon a drop in pressure in the glycol piping system. Pump shall cut in at nominally 35 psi, cut out at 45 psi. Both cut in and cut out pressures and differential are adjustable.

B. Pump operation to be monitored by BMS.
   1. Alarm:
      a. More than two cycles per 1/2 hour (adj)

b. Continuous operation for 10 minutes (adj)

3.19 EXHAUST FANS (EF6, EF7)

A. Basement Lounge Rm 019, EF-6:
   1. Room shall have an individual occupied schedule, with occupied times as selected by the campus.
   2. Fan shall run when wall mounted industrial duty push button is manually depressed by occupants. See drawings for required special legend plate.
   3. Push button activation will start a software timer with setpoint (adj.) of 60 minutes.
   4. Once pushbutton is depressed and software timer is started, ignore repeated pushbutton attempted activations.
   5. Fan will stop when space goes to un-occupied mode.
   6. Fan will stop and be locked out when outside air temperature falls below 50 degress F.

B. Lounge Rm 115, EF-7 Ceiling paddle fans (quantity 2)
   1. Both Fans shall be enabled by the DDC system when in occupied mode.
   2. Both fans shall operate simultaneously when commanded on.
   3. The fan speed for both fans shall be manually controlled by occupants using a factory supplied wall controller. Fan controller shall allow for manual control of fan function (on/off, speed control) for both fans in tandem.

3.20 MECHANICAL ROOM

A. Monitor Pneumatic control air compressor tank pressure, alarm on fall below set point (adj.) of 60 psi.

B. Monitor the space temperature flat plate sensor. The DDC system shall open the exhaust air damper and the intake air damper and cycles the exhaust fan to maintain the space temperature at set point (adj.).

C. Exhaust fan EF1 shall operate continuously when mechanical room temperature is above 70 degrees F.

D. Exhaust fan and outside air damper shall turn off & close when room temperature is below 60 degrees F.

E. When exhaust fan is commanded on and fails to operate, alarm on fail.

F. Fan shall stop and be locked out when outdoor temperature falls below setpoint (adj.) initial setting 45 degrees F.

G. Flood control system (FCIS): Monitor water discharge sensor, alarm on actuation & when FCIS closes water service flood control valve.

H. Domestic water return pumps (HWCP1 & HWCP2):
   1. Monitor domestic return water temperature immersion temperature sensor (use NSF compliant materials).
   2. When domestic return water falls below setpoint (adj.) initial setting 105 degrees F. activate return pump. When domestic return water rises above upper setpoint (adj.) initial setting 110 degrees F. stop pump.
   3. Single pump operation: Only one pump is required to operate at any time when return water temperature is within setpoint limits.
   4. Lead Lag Controls: Return pumps shall operate on a lead/ lag basis. Pumps shall automatically be assigned lead or lag duty on a weekly interval setpoint (adj.). If the lead pump fails, then start the lag pump.
   5. Pump status: Monitor pump operation and alarm to building operator if a pump fails while commanded on.

I. Domestic booster pump (BP1):

1. Monitor auxilary run contact from BP-1 controls to sense when pump commanded on.
2. Pump status: When pump commanded on, monitor pump status and alarm if booster pump fails.

3.21 ELECTRIC SWITCHGEAR ROOM

A. Monitor the space temperature flat plate sensor. The DDC system shall open the exhaust air damper and the intake air damper and cycles the exhaust fan to maintain the space temperature at set point (adj.).

B. Exhaust fan EF5 shall operate continuously when mechanical room temperature is above 70 degrees F.

C. Exhaust fan & outside air damper shall turn off & close when room temperature is below 60 degrees F.

D. When exhaust fan is commanded on and fails to operate, alarm on fail.

3.22 FIRE ALARM SYSTEM INTERFACE

A. Fan shut down signaling for HVAC equipment shall be by main fire alarm control panel. Fan shut down signals from the fire alarm panel shall include the following systems:
1. Energy Recovery Unit ERU1 & ERU2.
2. Exhaust Fans EF2 (Laundry), EF5 (Electric Room), EF8 (Fire pump room).

B. FACP system status: DDC system shall monitor fire alarm system status (for FACP normal).

C. FACP system alarm status: DDC system shall monitor fire alarm system for fan shut down signal (for FACP in alarm status).

D. Fan status alarm condition reports: Discontinue individual fan status alarm reports when fire alarm panel is in alarm status.

E. In event FACP goes into alarm: After fire alarm clears alarm signal, and FACP panel returns to normal status, BMS shall automatically restart all HVAC fans, air handlers, and ERU units to normal mode units were in prior to alarm & fan shut down.

3.23 GENERATOR INTERFACE

A. Monitor Generator ready to run contact, alarm if generator fails and is NOT ready to start.

B. Monitor generator running contact. Generator running shall include exercise operation as well as emergency operation. Trend and record last 6 months of generator operation.

C. Monitor generator in alarm contact, alarm to BMS on generator alarm condition.

D. Monitor emergency transfer switch contact, alarm on transfer to generator power.

E. Monitor stand by transfer switch contact, alarm on transfer to generator power.

3.24 FIRE PUMP ROOM

A. Monitor the space temperature flat plate sensor. The DDC system shall open the exhaust air damper and the intake air damper and cycles the exhaust fan to maintain the space temperature at set point (adj.).

B. Exhaust fan EF8 shall operate continuously when mechanical room temperature is above 70 degrees F.

C. Exhaust fan & outside air damper shall turn off & close when room temperature is below 60 degrees F.

D. When exhaust fan is commanded on and fails to operate, alarm on fail.

3.25 DATA ROOMS (FOR EACH FLOOR):

A. Monitor space wall temperature flat plate sensor.

B. Alarm when space temperature exceeds high limit set point 80 degrees (adj.).

C. Data Room 007, Exhaust fan EF9 shall operate continuously when space temperature sensor is above 80 degree F. set point (adj.). Exhaust fan EF9 shall operate when EF8 is also operating. If EF8 is off and EF9 is commanded on, then EF8 start/stop signal shall be overridden and commanded on.

D. Drain pans (Rm 105 & 106): Monitor drain pan water sensors, alarm on detection of presence of water.

E. Mechanical cooling: See alternate for mechanical self contained cooling systems. These systems will have hard wired controls between factory supplied temperature sensor and all indoor and outdoor units, see appendix A I/O notes for mini split units.

3.26 WATER HEATER ROOM (EF10) (WH1 & WH2)

A. Monitor space temperature flat plate sensor in water heater room. The DDC system shall open the exhaust air damper and the intake air damper and cycle the exhaust fan to maintain the space temperature at set point (adj.).

B. Exhaust fan EF10 shall start and operate continuously when water heater room temperature is above 80 degrees F.

C. Exhaust fan & outside air damper shall turn off & close when room temperature is below 70 degrees F.

D. Fan status: When exhaust fan is commanded on and fails to operate, alarm on fail.

E. Alarm: Water Heater (WH-1): Communicate with water heater over Bacnet. Monitor water heater control panel, when WH-1 controller alarm is activated, provide alarm signal to BMS operator.

F. Alarm: Water heater (WH-2): Communicate with water heater over Bacnet. Monitor water heater control panel, when WH-2 controller alarm is activated, provide alarm signal to BMS operator.

END OF SECTION

Appendix A Temperature Control Points List

Description	I/O Type	Descriptor	Units	Notes
HTHW Heat Exchanger System				
Outside Air temperature sensor	AI	DYH.OAT	°F	
Outside air relative humidity sensor	AI	DYH.OAH	%RH	
HTHW supply fluid immersion temperature	AI	DYH.HTHW.HWS	°F	Alarm on out of limits (High and Low)
HTHW return fluid immersion temperature	AI	DYH.HTHW.HWR	°F	Alarm on out of limits (High and Low)
HTHW bypass control valve	AO	DYH.HTHW.BYPASSCV		
HE1 HTHW control valve	AO	DYH.HX1.V1		
HE2 HTHW control valve	AO	DYH.HX2.V1		
HTHW Flow Meter - Flow	AI	DYH.HTHW.FLOWRATE	GPM	BACNET- interface
HTHW Flow Meter Flow Totalizer	AI	DYH.HTHW.FLOWTOTAL	GPM	BACNET- interface
HTHW Flow Meter - Energy Use	AI	DYH.HTHW.BTU	Btu/Hr	BACNET- interface
HE1 Secondary HWS temperature	AI	DYH.HX1.SWT	°F	Alarm on out of limits (High and Low)
HE1 Secondary HWR temperature	AI	DYH.HX1.RWT	°F	Alarm on out of limits (High and Low)
HE1 Secondary HWS Hi limit temperature		n/a		Hard wired safety limit
HE1 Secondary HWS Flow sensor				Safety lock out
HE2 Secondary HWS temperature	AI	DYH.HX2.SWT	°F	Alarm on out of limits (High and Low)
HE2 Secondary HWR temperature	AI	DYH.HX2.RWT	°F	Alarm on out of limits (High and Low)
HE2 Secondary HWS Hi limit temperature		n/a		Hard wired safety limit
HE2 Secondary HWS Flow sensor				Safety lock out
Campus HTHW system active	DI	DYH.HTHWSYSACTIVE		Event schedule, coordinate with operator input
Secondary HW Distribution Pumps System				
Secondary HW supply fluid temperature	AI	DYH.HHW.SWT	°F	Alarm on out of limits (High and Low)
Secondary HW return fluid temperature	AI	DYH.HHW.RWT	°F	Alarm on out of limits (High and Low)
Differential Pressure sensor 1	AI	DYH.HHW.DPT1	PSI	Alarm on out of limits (High and Low)
Differential Pressure sensor 2	AI	DYH.HHW.DPT2	PSI	Alarm on out of limits (High and Low)
P1 pump start/stop	DO	DYH.P1.SS		
P1 pump speed signal	AO	DYH.P1.SPEED		
P1 pump status	DI	DYH.P1.STATUS		Alarm on fail
P1 pump VFD fault	DI	DYH.P1.VFDFAULT		Alarm on fail
P2 pump start/stop	DO	DYH.P2.SS		
P2 pump speed signal	AO	DYH.P2.SPEED		
P2 pump status	DI	DYH.P2.STATUS		Alarm on fail
P2 pump VFD fault	DI	DYH.P2.VFDFAULT		Alarm on fail
P3 pump start/stop	DO	DYH.P3.SS		
P3 pump speed signal	AO	DYH.P3.SPEED		
P3 pump status	DI	DYH.P3.STATUS		Alarm on fail
P3 pump VFD fault	DI	DYH.P3.VFDFAULT		Alarm on fail
Glycol fill station run contact	DI	DYH.GLYCOLFILL.RUN		Alarm on two cycles in 1/2 hour or excessive runtin

Appendix A Temperature Control Points List

Description	I/O Type	Descriptor	Units	Notes
Energy Reovery Unit ERU1, (ERU2 Similar)				
Supply air temperature	AI	DYH.ERU1.SAT	°F	Alarm on out of limits (High and Low)
Return air temperature	AI	DYH.ERU1.RAT	°F	Alarm on out of limits (High and Low)
Supply fan start/stop	DO	DYH.ERU1.SAF		
Supply fan speed signal (Normal)	AO	DYH.ERU1.SVD		speed signal: Normal/Bypass/Econ
Supply fan speed signal (Bypass)	AO	DYH.ERU1.SVD		speed signal: Bypass/Econ (for lower setpoint)
Supply fan status	DI	DYH.ERU1.SFSTATUS		Alarm on fail
Supply fan VFD fault	DI	DYH.ERU1.SFVFDFLT		Alarm on fail
OA intake damper	DO	DYH.ERU1.OAD		
OA intake damper end switch	DI	DYH.ERU1.OADES		Alarm on fail
Supply filter bank delta press sensor	AI	DYH.ERU1.OFIL		Alarm on out of limits (High)
Exhaust fan start/stop	DO	DYH.ERU1.EAF		
Exhaust fan speed signal (Normal)	AO	DYH.ERU1.EVD		speed signal: Normal/Bypass/Econ
Exhaust fan speed signal (Bypass)	AO	DYH.ERU1.EVD		speed signal: Bypass/Econ (for lower setpoint)
Exhaust fan status	DI	DYH.ERU1.EFSTATUS		Alarm on fail
Exhaust fan VFD fault	DI	DYH.ERU1.EFVFDFLT		Alarm on fail
Exhaust damper	DO	DYH.ERU1.EAD		
Exhaust damper end switch	DI	DYH.ERU1.EADES		Alarm on fail
Exhaust filter bank delta press sensor	AI	DYH.ERU1.EAFILDP		Alarm on out of limits (High)
Heat wheel enable	DO	DYH.ERU1.WHL		
Heat wheel rotation sensor proof	DI	DYH.ERU1.HWheelSTATUS		Alarm on fail
OA wheel bypass dampers	DO	DYH.ERU1.BYP.OAD		
EA wheel bypass dampers	DO	DYH.ERU1.BYP.EAD		
P5 pump (ERU1) start/stop	DO	DYH.P5.SS		
P5 pump (ERU1) status	DI	DYH.P5.STATUS		Alarm on fail
P6 pump (ERU2) start/stop	DO	DYH.P6.SS		
P6 pump (ERU2) status	DI	DYH.P6.STATUS		Alarm on fail
HW coil 3 way control valve	AO	DYH.ERU1.HCV		
HW coil low temp discharge freeze stat	DI	DYH.ERU1.LTCFREEZE		Alarm on trip
Fire Alarm Status	DI	DYH.ERU1.FACPSTATUS		
Energy Recovery Unit ERU3,				
Supply air temperature sensor	AI	DYH.ERU3.SAT	°F	
Space temp sensor Computer Rm 010	AI	DYH.ERU3.RM010TEMP	°F	
Space temp sensor Electric Rm 009	AI	DYH.ERU3.RM009TEMP	°F	
ERU3 start/stop	DO	DYH.ERU3.SAF		
ERU3 fault	DI	DYH.ERU3.FAULT		
Supply fan status	DI	DYH.ERU3.SAFSTATUS		
Exhaust fan status	DI	DYH.ERU3.EAFSTATUS		
OA intake damper	DO	DYH.ERU3.OAD		
Exhaust damper	DO	DYH.ERU3.EAD		
Heat wheel rotation sensor	DI	DYH.ERU#.WHEELROT		
HC1 HW coil 2 way control valve	AO	DYH.HC1.HWCV		

Appendix A Temperature Control Points List

Description	I/O Type	Descriptor	Units	Notes
Laundry ventilation system,				
Space temperature flat plate sensor	AI	DYH.RM004.TEMP	°F	
EF2 exhaust fan start/stop	DO	DYH.EF2.SAFSS		
EF2 exhaust fan speed signal	AO	DYH.EF2.SAFSPEED		
EF2 exhaust fan status	DI	DYH.EF2.SAFSTATUS		Alarm on fail
EF2 fan VFD fault	DI	DYH.EF2.VFDFAULT		Alarm on fail
OA intake damper	DO	DYH.HC2.OAD		
Supply air temperature sensor	AI	DYH.HC2.SAT	°F	
HC2 HW coil 3 way control valve	AO	DYH.HC2.HWCV		
HC2 HW coil LAT low temp freeze stat	DI	DYH.HC2.LTCFREEZE		
P4 pump start/stop	DO	DYH.P4.SS		
P4 pump status	DI	DYH.P4.STATUS		Alarm on fail
Laundry occupancy sensor	DI	DYH.RM004.OCCSENSOR		
Dryer #1 current sensor	DI	DYH.RM004.DRYER1STATUS		
Dryer #1 discharge temp sensor	AI	DYH.RM004.DRYER1DAT	°F	Strap on type
Dryer #2 current sensor	DI	DYH.RM004.DRYER2STATUS		
Dryer #2 discharge temp sensor	AI	DYH.RM004.DRYER2DAT	°F	Strap on type
Dryer #3 current sensor	DI	DYH.RM004.DRYER3STATUS		
Dryer #3 discharge temp sensor	AI	DYH.RM004.DRYER3DAT	°F	Strap on type
Dryer #4 current sensor	DI	DYH.RM004.DRYER4STATUS		
Dryer #4 discharge temp sensor	AI	DYH.RM004.DRYER4DAT	°F	Strap on type
Dryer #5 current sensor	DI	DYH.RM004.DRYER5STATUS		
Dryer #5 discharge temp sensor	AI	DYH.RM004.DRYER5DAT	°F	Strap on type
Dryer #6 current sensor	DI	DYH.RM004.DRYER6STATUS		
Dryer #6 discharge temp sensor	AI	DYH.RM004.DRYER6DAT	°F	Strap on type
Dryer #7 current sensor	DI	DYH.RM004.DRYER7STATUS		
Dryer #7 discharge temp sensor	AI	DYH.RM004.DRYER7DAT	°F	Strap on type
Dryer #8 current sensor	DI	DYH.RM004.DRYER8STATUS		
Dryer #8 discharge temp sensor	AI	DYH.RM004.DRYER8DAT	°F	Strap on type
Dryer #9 current sensor	DI	DYH.RM004.DRYER9STATUS		
Dryer #9 discharge temp sensor	AI	DYH.RM004.DRYER9DAT	°F	Strap on type
Radiant Heat System				
Space temperature flat plate sensor Rm 117	AI	DYH.RM117.TEMP	°F	
HE3 HW 2 way control valve	AO	DYH.HE3.HWCV		
Glycol supply fluid temperature	AI	DYH.HE3.HWLWT	°F	
Glycol return fluid temperature	AI	DYH.HE3.HEEWT	°F	
P7 pump start/stop	DO	DYH.P7.SS		
P7 pump status	DI	DYH.P7.STATUS		Alarm on fail

Appendix A Temperature Control Points List

Description	I/O Type	Descriptor	Units	Notes
Perimeter Fin Tube Control System, (Typical For Multiple Rooms)				Multiple rooms each floor
Space temperature sensor	AI	DYH.RM??.F?.TEMP	°F	floor level
Space set point bias adjustment	AI	DYH.RM??.F?.SPBIASADJ		Virtural ± 2 °F
Heating control valve (2 way)	AO	DYH.RM??.F?.HWCV		see riser for locations
Heating control valve (3 way)	AO	DYH.RM??.F?.HWCV		see riser for locations
Cabinet unit Heater, (Typical For Multiple Rooms)				
Space temperature sensor	AI	DYH.RM??.CH?.TEMP	°F	
Fan start/stop	DO	DYH.RM??.CH?.SAFSS		provide control relay
Fan status	DI	DYH.RM??.CH?.SAFSTATUS		
Hot Water control valve	AO	DYH.RM??.HWCV		
Unit Heater, (Typical For Multiple Rooms)				
Space Temperature sensor	AI	DYH.RM??.TEMP	°F	
Fan start/stop	DO	DYH.RM??.UH?.SAFSS		provide control relay
Fan status	DI	DYH.RM??.UH?.SAFSTATUS		
Elevator HVAC System				
Space temperature sensor Control Rm 416	AI	DYH.RM416.TEMP	°F	
Supply air temperature sensor	AI	DYH.AC3.SAT	°F	
AC3 AC unit		n/a		Note 2.
ACC2 Outdoor unit		n/a		Note 2.
Elevator sump Leak detector	DI	DYH.ELEV.LEAK		Provide control wiring Note 5.
Elevator sump pump SP-1 pump panel alm	DI	DYH.ELEVSP1.alarm		Alarm on pump fail
Mechanical Attic Penthouse Space				
Space temperature sensor	AI	DYH.RM501.TEMP	°F	
OA L13 intake damper (east)	DO	DYH.RM501.OAD2		
EF3 LX exhaust damper	DO	DYH.EF3.EAD		
EF3 Exhaust fan start/stop	DO	DYH.EF3.SAFSS		
EF3 Exhaust fan status	DI	DYH.EF3.SAFSTATUS		Alarm on fail
Stair 3 Attic Level				
Space temperature sensor	AI	DYH.RMST3ATTIC.TEMP	°F	
EA L12 Convection relief damper	DO	DYH.RMST3ATTIC.OAD1		
Fire Alarm Interface				
FACP normal	DI	DYH.FACP.NORMAL		
FACP In alarm	DI	DYM.FACP.INALARM		
Electric Switchgear Room				
Electric Meter (demand KW)	AV	DYH.EMETER.DEMANDKW		BACNET interface
Electric Meter (energy KWH)	AV	DYH.EMETER.COSUMKWH		BACNET interface
Space temp flat plate sensor Rm 008A	AI	DYH.RM008.TEMP	°F	
OA intake damper	DO	DYH.EF5.OAD		
EF5 Exhaust fan start/stop	DO	DYH.EF5.EAFSS		
EF5 Exhaust fan status	DI	DYH.EF5.STATUS		Alarm on fail

Appendix A Temperature Control Points List

Description	I/O Type	Descriptor	Units	Notes
Generator Interface				
Generator ready to run	DI	DYH.GEN.READYTORUN		
Generator running	DI	DYH.GEN.RUNNING		
Generator in fault	DI	DYH.GEN.FAULT		Alarm on fail
Emergency transfer switch	DI	DYH.GEN.TSEMERG		Alarm on transfer
Stand by transfer switch	DI	DYH.GEN.TSSTANDBY		Alarm on transfer
Mechanical Room General				
Air Compressor tank pressure	DI	DYH.CAC1.TKPRESSSTATUS		
Space temperature flat plate sensor Rm 011	AI	DYH.RM011.TEMP	°F	
OA L1 intake damper	DO	DYH.EF1.OAD		
EF1 Exhaust fan start/stop	DO	DYH.EF1.EAFSS		
EF1 Exhaust fan status	DI	DYH.EF1.EAFSTATUS		Alarm on fail
Flood control system (FCIS)	DI	DYH.RM011.FCISSTATUS		Monitor & alarm
Domestic CW BP-1 booster pump aux run	DI	DYH.BP1.AUXRUN		Monitor run contact
Domestic CW BP-1 booster pump status	DI	DYH.BP1.STATUS		Monitor & alarm on fail
Domestic HW return temp sensor	AI	DYH.DHWR.EWT		Domestic water
HWCP1 Domestic HW return pump S/S	DO	DYH.HWCP1.SS		
WWCP1 Status	DI	DYH.HWCP1.Status		Monitor & alarm on fail
HWCP2 Domestic HW return pump S/S	DO	DYH.HWCP2.SS		
WWCP2 Status	DI	DYH.HWCP2.Status		Monitor & alarm on fail
Water service sub meter rate	AI	DYH.WMETER.RATE		Monitor flow rate
Water service sub meter totalizer	DI	DYH.WMETER.TOTAL		Monitor totalizer
Fire Pump Room				
Space temperature flat plate sensor Rm 006	AI	DYH.RM006.TEMP	°F	
OA LX intake damper	DO	DYH.EF9.OAD		
EF8 exhaust fan start/stop	DO	DYH.EF9.EAFSS		
EF8 Fan status	DI	DYH.EF9.STATUS		Alarm on fail
Water Heater Room				
Space temp flat plate sensor Rm 024	AI	DYH.RM024.TEMP	°F	
Nat gas meter flow rate	AI	DYH.NGMETER.RATE		Monitor flow rate
Nat gas meter flow totalizer	DI	DYH.NGMETER.TOTAL		Monitor totalizer
Water heater WH-1 fault	DI	DYH.WH1.FAULT		Monitor & alarm BACNET interface
Water heater WH-2 fault	DI	DYH.WH2.FAULT		Monitor & alarm BACNET interface
EF10 Exhaust fan start/stop	DO	DYH.EF1SS		
EF10 Status	DI	DYH.EF10.FAULT		Alarm on fail
OA & EA damper	DO	DYH.EF10.OAD		
Lounge Rm 019,				
Space temperature sensor	AI	DYH.RM019.TEMP	°F	
EF6 exhaust fan manual PB S/S	DO	DYH.EF6.PBSS		Wall mount momentary PB switch & legend PL
EF6 exhaust fan enable Fan start/stop	DO	DYH.EF6.SAFENABLE		Use software timer
EF6 status	DI	DYH.EF6.STATUS		
Multiple fin control valve (1)	AO	DYH.F3.HWCV		
Lounge Rm 115,				
Space temperature sensor	AI	DTH.RM115.Temp	°F	
Multiple fin control valve (1)	AO	DYH.RM115.HWCV		
EF7 ceiling axial fan enable	DO	DYH.EF7.ENABLE		Use 1 point for both fans
EF7 speed controller	--	n/a		Hard wire controls to both fans, Note 4.

Appendix A Temperature Control Points List

Description	I/O Type	Descriptor	Units	Notes
Resident Director Office Suite,				
For local fin tube, see perimeter fin control		n/a		
AC1 Indoor unit Living/kitchen space 014		n/a		Note 2.
AC2 Indoor unit Bedroom 014C		n/a		Note 2.
ACC1 Outdoor unit		n/a		Note 2.
EF4 Toilet exhaust fan manual switch				wall switch hard wired by EC
Leak sensor WH-3 RD laundry Rm 014A	DI	DYH.RM014A.LEAK		Monitor & alarm Note 5
Data Rooms				
Space temp flat plate sensor Rm 007	AI	DYH.RM007.TEMP	°F	Monitoring point
EF9 start/stop	DO	DYH.EF9.EAFSS		hard wired
EF9 EAF status	DI	DYH.EF9.EAFSTATUS		
Space temp flat plate sensor Rm 105	AI	DYH.RM105.TEMP	°F	Monitoring point
Space temp flat plate sensor Rm 212	AI	DYH.RM212.TEMP	°F	Monitoring point
Space temp flat plate sensor Rm 314	AI	DYH.RM314.TEMP	°F	Monitoring point
Space temp flat plate sensor Rm 415	AI	DYH.RM415.TEMP	°F	Monitoring point
AC-BA , sensor, Rm007	n/a	n/a		(Alternate) Note 3.
AC-1A, sensor, Rm 105	n/a	n/a		(Alternate) Note 3.
Drain Pan leak sensor Rm 105	DI	DYH.RM105 .LEAK		Alarm on fail Note 5.
ACC-1A, Grade	n/a	n/a		(Alternate) Note 3.
Drain pan leak sensor Rm 106	DI	DYH.RM106.LEAK		Alarm on fail Note 5.
AC-2A, sensor, Rm 212	n/a	n/a		(Alternate) Note 3.
AC-3A, sensor, Rm 314	n/a	n/a		(Alternate) Note 3.
AC-4A, sensor, Rm 415	n/a	n/a		(Alternate) Note 3.
ACC-2A, Attic balcony	n/a	n/a		(Alternate) Note 3.
General Notes for Control Points list:				

1. Provide I/O points to comply with the following: All points included in control points list, drawing notes, and as required to meet all sequences. (required for all I/O points unless noted otherwise)
2. For Base Bid RD suite & Elevator system mini split air conditioners, provide field controls wiring for device indicated.
3. For Alternate Bid, Data rooms Mini Split Airconditioners, provide field controls wiring for device indicated.
4. BAS system sub contract shall provide all control wiring and raceways and accessories, complet, to device(s).
5. BAS system sub contract shall provide 115 VAC power extension and 24 VAC control power, include control circuit transformer, and associated wiring to sensor.

General Notes for Mini Split Unit Wiring: (Provide where Mini split equipment used)

A. Outdoor unit to indoor unit: Provide 18 AWG 1 pair shielded 18-2 run in separate conduit from power wiring

B. Indoor unit to indoor unit: Provide 18 AWG 1 pair shielded 18-2 run in separate conduit from power wiring

B. Wall sensor to indoor unit: Provide 22 AWG shielded, 3 conductor cable.

Appendix B Temperature I/O Points Trending & Recording

System Component or Unit	Measurement Parameter	Priority	Frequency	Max Retention
Energy Meters				
Electric meter	Electric power demand Peak (KW)	High	15 min.	1 year
Electric meter	Electric Power Consumption (KWH)	High	15 min.	1 year
HTHW Meter	HTHW usage peak rate (max Gallon/Hr.)	High	15 min.	1 year
HTHW Meter	HTHW consumption (Total Gallons)	High	15 min.	1 year
HTHW Meter	HTHW BTU (Total BTU)	High	15 min.	1 year
Gas Meter Flow Rate	Usage Rate (Therms/Hr)	High	15 min.	1 year
Gas Meter Flow Totalizer	Gas consumption total (Therms)	High	15 min.	1 year
Water meter	Usage Rate (Gallons/Hr)	High	15 min.	1 year
Water meter	Water consumption (Gallons)	High	15 min.	1 year
HTHW & Main Piping Distribution System				
HTHW sensors	HTHW supply temperature	Medium	1 hour	1 year
HTHW sensors	HTHW return temperature	Medium	1 hour	1 year
HTHW to WH-4	Future			
HTHW to WH-4	Future			
Secondary HW sensors	Glycol loop supply temperature	Low	1 hour	1 year
Secondary HW sensors	Glycol loop return temperature	Low	1 hour	1 year
Pump P1	Run Status	Medium	15 min.	6 Months
Pump P1	Variable speed signal	Medium	15 min.	6 Months
Pump P2	Run Status	Medium	15 min.	6 Months
Pump P2	Variable speed signal	Medium	15 min.	6 Months
Pump P3	Run Status	Medium	15 min.	6 Months
Pump P3	Variable speed signal	Medium	15 min.	6 Months
Student bed room(s) (Typical for all Student Bedrooms)				
Wall sensor	Space temperatures	High	1 hour	10 months
Energy Reovery Unit ERU1, (ERU2 Similar)				
Supply air temperature	Supply air temperature	Medium	1 hour	10 months
Return air temperature	Return air temperature	Medium	1 hour	10 months
Supply fan status	SAF run time	Medium	1 hour	10 months
SAF speed signal (Normal)	Variable speed level	Medium	1 hour	10 months
SAF speed signal (Bypass/Econ)	Variable speed level	Medium	1 hour	10 months
Exhaust fan status	EAF run time	Medium	1 hour	10 months
EAF speed signal (Normal)	Variable speed level	Medium	1 hour	10 months
EAF speed signal (Bypass/Econ)	Variable speed level	Medium	1 hour	10 months

Appendix B Temperature I/O Points Trending & Recording

System Component or Unit	Measurement Parameter	Priority	Frequency	Max Retention
Energy Recovery Unit ERU3,				
Supply air temperature	Supply air temperature	Medium	1 hour	10 months
Wallsensor Computer Rm 010	Space temperatures	Medium	1 hour	10 months
Wall sensor Electric Rm 009	Space temperatures	Medium	1 hour	10 months
SAF status	SAF run time	Medium	1 hour	10 months
EAF status	EAF run time	Medium	1 hour	10 months
Laundry ventilation system,				
Space temperature sensor	Supply air temperature	Medium	1 hour	10 months
EF2 exhaust fan status	SAF run time	Medium	1 hour	10 months
EF2 exhaust fan speed signal	Variable speed level	Medium	1 hour	10 months
Supply air temperature sensor	Supply air temperature	Medium	1 hour	10 months
		Medium	1 hour	10 months
P4 pump status	Run Status	Medium	1 hour	10 months
Laundry occupancy sensor	Occupied status	Medium	1 hour	10 months
Elevator HVAC System				
Wall sensor Control Rm 416	Space temperatures	Medium	1 hour	1 year
Supply air temperature sensor	Supply air temperature	Medium	1 hour	1 year
Data Rooms				
Wall sensor Rm 007	Space temperatures	Medium	1 hour	1 year
Wall sensor Rm 105	Space temperatures	Medium	1 hour	1 year
Wall sensor Rm 212	Space temperatures	Medium	1 hour	1 year
Wall sensor Rm 314	Space temperatures	Medium	1 hour	1 year
Wall sensor Rm 415	Space temperatures	Medium	1 hour	1 year

SECTION 232113
HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings for:
   1. Heating water piping system 90-200 degrees F.

B. Valves:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.

C. Water Treatment and Glycol Solutions

1.2 RELATED REQUIREMENTS

A. Asbestos and PCBs must be abated completely prior to any task unless demolition is required to access the asbestos or PCBs. If asbestos or suspected hazardous materials are discovered and/or disturbed, cease operations and notify Owner and Owner's Representative immediately.

1.3 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

E. ASME B31.9 - Building Services Piping; 2014.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

G. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

H. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

J. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

K. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2013a.

L. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems; 2011.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.4 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Use non-conducting dielectric connections whenever jointing dissimilar metals.

D. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

E. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.5 SUBMITTALS

A. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

B. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Provide manufacturers catalogue information.
   3. Indicate valve data and ratings.

C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.6 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections except on radiant heat pump, where threaded unions are permissible.

D. Valves: Provide valves where indicated and as follows:
   1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap; pipe to nearest floor drain.

2. In hot water heating water piping systems, 125 pound butterfly valves and ball valves shall be used for isolation valves.

2.2 HEATING HOT WATER PIPING

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
   1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
   2. Threaded Joints: ASME B16.3, malleable iron fittings.
   3. Fittings: ASME B16.3, malleable iron or ASTM A 234/A 234M, wrought steel welding type.
   4. Use for piping over 2" in size.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L, hard drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver and water soluble flux conforming to ASTM B813.
   2. Use for pipng 2" and under.

2.3 RADIANT HEATING PIPING

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L annealed.
   1. Fittings: ASME B16.22, wrought copper.
   2. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.
   3. Flux: Water soluble confroming to ASTM B813.

B. Polyethylene Pipe: ASTM F876 or ASTM F877, cross-linked polyethylene tubing with oxygen barrier, 100 psig operating pressure at 180 degrees F.
   1. Fittings: Brass and copper.
   2. Joints: Manufacturer approved mechanical compression fittings.

2.4 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type L, drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver and water soluble flux conforming to ASTM B813.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon steel, adjustable, clevis.

C. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

G. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

H. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

I. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

J. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

K. Vertical Support: Steel riser clamp.

L. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

M. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

N. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

O. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.6 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Under:
   1. Ferrous Piping: 150 psig malleable iron, threaded.
   2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 Inches:
   1. Ferrous Piping: 150 psig forged steel, slip-on.
   2. Copper Piping: Bronze.
   3. Gaskets: 1/16 inch thick preformed neoprene.

C. Dielectric Connections:
   1. Waterways:
      a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
      b. Dry insulation barrier able to withstand 600 volt breakdown test.
      c. Construct of galvanized steel with threaded end connections to match connecting piping.
      d. Suitable for the required operating pressures and temperatures.
   2. Flanges:
      a. Dielectric flanges with same pressure ratings as standard flanges.
      b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
      c. Dry insulation barrier able to withstand 600 volt breakdown test.
      d. Construct of galvanized steel with threaded end connections to match connecting piping.
      e. Suitable for the required operating pressures and temperatures.

2.7 BALL VALVES- HOT WATER PIPING SYSTEMS

A. Manufacturers:
   1. Apollo Industries; Model 77:
   2. Nibco, Inc; Model S585-70:

B. Up To and Including 2-1/2 inches:
   1. Bronze two piece body, stainless steel ball, full port, teflon seats and stuffing box ring, extended lever handle with balancing stops, solder ends with union.

2.8 BUTTERFLY VALVE - HOT WATER PIPING SYSTEMS

A. Manufacturers:
   1. Nibco, Inc; Model LD 2000:
   2. Grinnel Valve; Model LD8281:

B. Use for piping 3' and over other than high temperature hot water service.

C. Body: Cast or ductile iron with resilient replaceable EPDM seat, lug ends, extended neck.

D. Disc: Construct of aluminum bronze.

E. Operator: 10 position lever handle.

2.9 SWING CHECK VALVE- HOT WATER PIPING SYSTEMS

A. Manufacturers:
   1. Nibco, Inc:
   2. Milwaukee Valve Company:

B. Up To and Including 3 Inches:
   1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.
   2. Bronze material used in valve construction shall comform to ASTM B61 ir B62.

C. Over 2 Inches:
   1. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.10 FLOW CONTROL VALVES- HOT WATER PIPING SYSTEMS

A. Manufacturers:
   1. ITT Bell & Gossett:
   2. Taco, Inc:
   3. FDI, Inc.:

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

C. Automatic flow control valve, cartridge type, able to maintain flow range over a differential of 2-32 psi, line size unless noted otherwise, brass body with stainless steel cartridge components, FDI model YR or accepted equal.

D. Bronze material used in valve construction shall conform to ASTM B61 or B62.

2.11 WATER TREATMENT AND GLYCOL SOLUTIONS

A. Water Treament - Hot Water Systems
   1. Contact water treatment installer at least two weeks prior to hydrotesting systems to insure chemicals are onsite for pre-treatment and post-treatment. All costs for material and labor of water treatment shall bE by Division 23.
   2. For initial cleaning of the system, provide a liquid cleaner recommended by Glycol solution manufacturer.
   3. Glycol
      a. Provide a 40% inhibited propylene glycol solution, Dow Chemical Dowfrost or equal.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment using jointing system specified.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

E. After completion, fill, clean, and treat systems.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and to avoid interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Sleeve pipe passing through partitions, walls and floors.

F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods. Maintain rating of assemblies being penetrated. Follow UL listed penetration details.

G. Slope piping and arrange to drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
   2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   3. Place hangers within 12 inches of each horizontal elbow.
   4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   6. Provide copper plated hangers and supports for copper piping.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

K. Provide access where valves and fittings are not exposed.

L. Use eccentric reducers to maintain top of pipe level.

M. Install valves with stems upright or horizontal, not inverted.

3.3 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1-1/4" and smaller: Maximum span, 6 feet; minimum rod size, 1/4 inch
   2. 1-1/2" and larger: Maximum span, 10 feet
      a. 2-1/2" pipe and smaller: minimum rod size, 3/8 inch
      b. 3" pipe and larger: minimum rod size, 1/2 inch

B. Hanger Spacing for Steel Piping.
   1. All Sizes: Maximum span, 12 feet;
      a. 1" and smaller: minimum rod size, 1/4 inch
      b. 1-1/4" to 2-1/2": minimum rod size, 3/8 inch
      c. 3" pipe and larger: 1/2" rod size

END OF SECTION

SECTION 232114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Expansion tanks.
B. Air vents.
C. Air separators.
D. Strainers.
E. Suction diffusers.
F. Combination pump discharge valves.
G. Balancing valves.
H. Relief valves.
I. Glycol system.
J. Glycol specialties.
K. Chemical Feeder

1.2 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

1.3 SUBMITTALS

A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary protective coating on cast iron and steel valves.
C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 BLADDER TYPE EXPANSION TANKS

A. Manufacturers:
   1. Amtrol Inc:
   2. Taco, Inc:
B. Construction: Welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); supplied with National Board Form U-1, rated for working pressure of 125 psi, with flexible EPDM blatter sealed into tank, and steel support stand.
C. Accessories: Pressure gage and air-charging fitting, tank drain;

2.2 AIR VENTS

A. Manufacturers:
   1. Armstrong International, Inc:

2. Taco, Inc:

B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Float Type:
1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2.3 AIR SEPARATORS

A. Centrifugal Air Separators/Strainers:
1. Manufacturers:
a. ITT Bell & Gossett:
b. Taco, Inc:
2. Steel, tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.4 STRAINERS

A. Manufacturers:
1. Armstrong International, Inc:
2. Spirax Sarco Inc.; Model 34:

B. Size 2 inch and Under:
1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 2-1/2 inch to 4 inch:
1. Flanged sast steel body for 600 PSI working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

2.5 SUCTION DIFFUSERS

A. Manufacturers:
1. ITT Bell & Gossett:
2. Taco Inc.:

B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh start up screen, and permanent magnet located in flow stream and removable for cleaning.

C. Accessories: Adjustable foot support, blowdown tapping in bottom, gage tapping in side.

2.6 COMBINATION PUMP DISCHARGE VALVES

A. Manufacturers:
1. Taco, Inc:

B. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psi operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

2.7 BALANCING VALVES

A. Manufacturers:
1. ITT Bell & Gossett
2. Taco, Inc

B. Size 2 inch and Smaller:
   1. Provide ball style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded connections.
   2. Metal construction materials consist of bronze or brass.
   3. Non-metal construction materials consist of Teflon or EPDM.

C. Size 2.5 inch and Larger:
   1. Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged connections.
   2. Valve body construction materials consist of cast iron or ductile iron.
   3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, or EPDM.

2.8 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.9 GLYCOL SYSTEM

A. Mixing Tank: 55 gallon steel drum with fittings suitable for filling and pump for charging.

B. Storage Tank: Closed type, welded steel constructed, tested and stamped in accordance with ASME BPVC-VIII-1; 100 psi rating; cleaned, prime coated, and supplied with steel support saddles. Construct with tappings for installation of accessories.

C. Expansion Tank: Diaphragm type with vent fitting with air separator, and automatic air vent.

D. Contractor to provide initial fill of specified glycol solution for glycol piping system.

E. Glycol Solution:
   1. Inhibited propylene glycol and water solution mixed 40 percent glycol - 60 percent water, suitable for operating temperatures from -30 degrees F to 250 degrees F.

2.10 CHEMICAL FEEDER

A. 2 gallon vertical bypass feeder constructed of 11 gauge steel with a max working pressure of 300 psig at 200 degrees F. Includes a cast iron cap and cartridge filter.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Provide manual air vents at system high points and as indicated.

C. Provide valved drain and hose connection on strainer blow down connection.

D. Provide pump suction fitting on suction side of centrifugal pumps. Remove temporary strainers after cleaning systems.

E. Provide combination pump discharge valve on discharge side of centrifugal pumps.

F. Support pump fittings with floor mounted pipe and flange supports.

G. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.

END OF SECTION

SECTION 232116
HIGH TEMPERATURE HOT WATER PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings for:
   1. High temperature hot water piping system.

B. Valves:
   1. Gate valves.

1.2 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

B. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

C. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

D. American Welding Society B2.1, Specifications for Welding Procedure and performance Qualifications.

E. ASME B31.1 Power Piping.

1.3 SUBMITTALS

A. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.1 as per ASI 52 and applicable federal, state, and local regulations.

B. Piping: Provide piping, and fittings as required.

C. Valves: Provide valves where indicated and as follows:
   1. In high temperature hot water system, 600 pound gate valves shall be used.
   2. In drain and vent system, 150 pound valves shall be used.

2.2 HIGH TEMPERATURE HOT WATER PIPING

A. Steel Pipe: Black, Schedule 80, ASTM A-106. plain end seamless pipe.
   1. Welded Joints: ASTM A 234/A 234M, wrought steel weld type fittings with finish matching piping.
   2. Fittings 2" and smaller shall be socket weld forged black steel, ASTM A 105, Grade II, and ANSIB16.11, 3000 pounds.
   3. Fittings 3" and larger shall be butt weld seamless black steel, long radius, conforming to ASTM A105, Grade II, and ANSI B16.11, 3000 pounds.

4. Flanges shall be forged black steel, conforming to ASTM A234 and ASA B 16.5, Class 600LB, with serrated raised face with welding neck. Gaskets shall be Flexitallic. Studs and nuts shall conform to ASTM 193 Grade B7.

2.3 WELDING

A. Welding of all piping conform to the requirements as specified herin.

B. All welding of pipe joints and procedures shall be in accordance with the following:
   1. Section IX - Welding and brazing qualifications of the ASME Boiler and Pressure Vessel Code.
   2. American Welding Society B2.1 - Specification for Welding Procedure and Performance Qualifications.
   3. ASME B31.1 Power Piping.

C. Prepare Certification of Welder Performance Qualification Test containing the information detailed in form QW-484 and QB-484, of ASME Section IX for all welders to be employed for fabrication. These documents shall be provided to the Engineer for approval of each welder, and shall be kept on file. Only Engineer-approved welders may weld any pipe on the project.

D. The Owner reserves the right to remove any welder from the project for any reason.

E. Parts that are to be joined by welding may be held in alignment during the welding process by the use of bars, jacks and clamps.

F. Socket weld couplings shall be used for welded line joints, where specified, in nominal pipe sizes 1-1/2 inches and smaller.

G. Piping
   1. Weld end preparations for field joints and for joining to supplied items shall be in accordance with Chapter V of ASME B31.1. All weld ends preparation dimensions shall be in accordance with ASME B16.25.
   2. Base pipe material shall be prepared in accordance with the following:
      a. The edges or surfaces of the parts to be joined by welding shall be machined and cleaned of all oil, grease, scale, rust, or other deleterious materials.
      b. Maximum joint gap distance shall be 3/16" for 2 1/2" NPS pipe and larger and 1/8" for 2" NPS and smaller.

H. Welding Processes
   1. Welding shall be performed by one or more of the following processes. Other processes may be permittted when the technical adequacy has been demonstrated to the satisfaction of the Owner and Engineer.
      a. Shielded Metal Arc (SMAW)-Only low hydrogen electrodes shall be permitted.
      b. Gas-Tungsten Arc (GTAW)-Non-consumable tungsten electrodes shall be AWS A5.12 Class EWTh-2. Filler metal addition shall be used with the gas-tungsten arc process.
      c. Gas-Metal Arc (GMAW)-The short circuiting arc deposition transfer mode shall not be used to join materials greater than 1/4" thickness. This practice may be used to deposit the root pass and additional weld passes in the root region of butt joints up to a deposited weld metal thickness of 1/4".
      d. Flux-Cored Arc (FCAW)-iCored wire designed for operation without the use of externally supplied shielding gas (i.e., self-shielded typed) is not allowed.
   2. The following shall establish, at a minimum the quality controls that shall be incorporated with any of the above mentioned welding processes:
      a. Initiation points of all weld passes and weld layers shall be staggered.
      b. When using the shielded metal arc process, the depth of weld metal deposited in each layer shall not exceed 3/16 inch.

c. Vertical position welding shall proceed uphill.
d. Complete penetration and fusion shall be achieved in all regions of the weld zone.
e. All slag, flux or foreign materials remaining on any bead of welding shall be renoved by grinding, shipping or wire brushing before depositing the next or successive bead.
f. Any cracks, slag incursions, incomplete fusion or blow holes that appear on the surface of any bead of welding shall be removed by chipping or grinding before depositing the next successive bead of welding.

I. Filler Materials
1. All welding filler materials, including any consumable inserts, shall comply with the requirements of ASME or AWS filler material specifications.
2. All Welding filler materials shall be stored in a clean, dry location protedted from contamination.
3. After opening of new sealed electrode containers or removal of electrodes from drying ovens, all electrodes, which are not emmediately issued for use, shall be stored in holding ovens at a minimum temperatue of 200F.

2.4 VISUAL EXAMINATION OF WELDS

A. Visual examinations will be performed by the Owner on 100% of all field welds to detect surface discontinuities in the completed welds. Visual examination will be performed on the final pass only. All welds, including all off-site welds will be visually inspected for cracks, contour and finish, bead reinforcement, undercutting, commercial inspection or testing agency to examine the welds. Provide access to all welds for testing, and provide full cooperation with the testing agency. Include all labor and materials as required to permit the visual examination.

B. The visual examination will examine each weld for any defect. The visual examination will be performed in accordance with ASME B31.1, Section 136.4.2. Repair any defects noted in the visual examination at no additional cost to the Owner. All repairs will be re-examined. Welds that are shown by visual examination to have any of the following types defects are unacceptable:
1. Cracks - external surface.
2. Undercut on surface, which is greater than 1/32 inch deep.
3. Weld reinforcement greater than 5/32 inch.
4. Lack of fusion of surface.
5. Incomplete penetration (applies only when inside surface is readily accessible).
6. Any other linear indications greater than 3/16" long.
7. Surface porosity with rounded indications having dimensions grater than 3/16" or four or more rounded indications separated by 1/16" or less edge to edge in any direction. Rounded indications are indications are indications which are circular or elliptical with their length less than three times their width.

C. The following additional visual quality examinations shall be performed:
1. Arc strikes shall be removed by grinding and the area examined for freedom from defects by liqid penetrate. Any crack or linear indications are unacceptable.
2. Grinding shall not result in a reduction in wall thickness below the minimum required by the applicable code, material specification, or design calculation.
3. Each weld shall be uniformed in width and size throughout its full length.
4. Wash pass welding (re-melting cover pass to smooth weld contour) is prohibited.
5. Butt welds shall be full penetration.
6. Socket welds, depth of insertion of pipe or tube within the socket or sleeve shall be 3/8 inch minimum.

7. Attachment Welds: All temporary welded attachments used for erection purposes shall be removed by mechanical cutting or air-arc cutting the attachment a distance from the supporting metal surface sufficient to preclude damage, but in no case less than 1/8 inch. The remainder of the attachment shall be ground flush with the base metal surface. The ground area shall then be exzmined visually to ensure freedom from defects. Under no conditions are temporary attachments to be removed by hammer blows.

D. Written reports for each visual examination performed by the Owner's testing agency will be available for review. The Owner's testing agency shall have the final word in determining the acceptability of any welds.

2.5 RADIOGRAPHIC EXAMINATION OF WELDS

A. Radiographic examinations will be performed by the Owner on the welds. The Owner will retain the services of a qualified commercial inspection or testing agency to examine the welds. The Owner will inspect 100% of the pipe welds using radiographic examination. Provide access to all welds selected by the Owner for testing, and provide full cooperation with the testing agency. Include all labor and materials as required to permit the radiographic examination.

B. All radiographic examinations shall be performed in accordance with ASME B31.1, Section 135.4.5. Welds that are shown by radiography to have any of the following types of discontinuities are unacceptable:
   1. Any type of crack or zone of incomplete fusion or penetration.
   2. Any other elongated indication which has a length greater than:
      a. 1/4 inch for t up to 3/4 inch inclusive.
      b. 1/3 t for t from 3/4 inch to 2 1/4 inch inclusive.
      c. 3/4 inch for t over 2 1/4 inch.
   3. Any group of indications in line that have an aggregate length greater than t in a length of 12t, except where the distance between the successive indications exceeds 6L where L is the longest indication in the group.
   4. Porosity in excess of that shown as acceptable in Appendix A-250 of Section I of the ASME Boiler and Pressure Vessal Code.
   5. Root concavity when there is an abrupt change in density, as indicated on the radiograph.

C. Written reports for each radiographic examination performed by the Owner's testing agency will be available for review. The Owner's testing agency shall have the final word in determining the acceptability of any welds.

2.6 GATE VALVES

A. Gate Valves: (2 1/2" and larger) valve shall be Powell Figure 3003 or equal as manufactured by Chapman or Walworth. Gate valves shall be ANSI class, cast steel weld end or flanged suitable for positive shut-off at 400F and 600 psi fluid conditions. Valves shall be outside screw, rising stem type with bolted bonnet.
   1. Body: Valve body shall be cast carbon steel 216 Grade WCB in accordance with ANSI B16.5 valve body and flange shall meet ANSI Class 600.
   2. Valve Trim: Valve disc, seat ring and stem shall be stainless steel.
   3. Flexible wedge - 13% chrome stainless steel or chrome faced carbon steel. Seat to be stalite hard faced. Seat to be threaded into the body and seal welded.
   4. Packing gland shall be ductile steel and the packing shall be suitable for the service noted.
   5. The handwheel shall be malleable iron, 12" diameter minimum.

B. Socket weld, forged steel gate valves (2" and lower); Valve shall be : Smith Figure 800 or equal as manufactured by Crane or Vogt. Use for vent and drain piping. Valves shall be suitable for positive shut-off at 400F and 600 psi fluid condition.
   1. Body: Valve body shall be forged carbon steel 216 Grade WCB in accordance with ASTM A105 - Grade II.
   2. Valve Trim: Chrome stellite faced or 316 stainless steel.
   3. Packing: Approved type for high temperature hot water service.
   4. Handwheel: Malleable Iron.

C. Valve up to 4" shall be actuated by a hand wheel, valves greater than 4" shall be actuated by a gear operator.

2.7 CHECK VALVES

A. Manufacturers:
   1. Velan Inc.:
   2. Crane Valve, Inc.: .
   3. Vogt, Inc.:

B. Over 2 Inches:
   1. Dual plate ty-pe with cast steel body, 600 psi, stainless steel trim, flanged ends. Rated for 400 degrees F.

2.8 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

E. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

F. Vertical Support: Steel riser clamp.

G. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

H. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.9 TESTING

A. Hydrostatic Testing of Piping.
   1. Hydrostatically test all new piping. Tests for all new piping shall be performed in accordance with part C2.270 of Section VIII of the ASME Boiler and Pressure Vessel Code, and the requirements noted in this Section of this Specification. All materials and equipment required to perform the hydrostatic test shall be furnished. All tests shall be performed successfully prior to insulation.
   2. Water of a potable quality shall be used for hydroststic testing. Test pressures shall be maintained in the systems for at least two hours with no visible leaks or loss of pressure.
   3. Unless otherwise specified, all piping shall be subjected to a minimum pressure of 600 psig.

4. All tests shall be witnessed, certified and documented by the Owner's Site Representative.
5. Any defective joints shall be repaired, their welds re-examined and re-tested.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment using jointing system specified.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION

A. Slope piping and arrange to drain at low points.

B. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

C. Install valves with stems upright or horizontal, not inverted. All valve installations shall be double valved.

END OF SECTION

SECTION 232123
HYDRONIC PUMPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. In-line circulators.

B. Vertical in-line pumps.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

C. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.4 EXTRA MATERIALS

A. Provide one set of mechanical seals for each pump.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Taco Inc.:

B. ITT Bell & Gossett:

C. Substitutions: See Section 016000 - Product Requirements.

2.2 HVAC PUMPS - GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

2.3 IN-LINE CIRCULATORS

A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 125 psi maximum working pressure.

B. Casing: Cast iron, with flanged pump connections.

C. Impeller: Non-ferrous keyed to shaft.

D. Bearings: Permanently-lubricated ball bearings.

E. Shaft: Stainless steel with bronze sleeve, integral thrust collar.

F. Seal: Manufacturer's standard seal, 225 degrees F maximum continuous operating temperature.

2.4 VERTICAL IN-LINE PUMPS

A. Type: Vertical, single stage, close coupled, radially split casing, for in-line mounting, for 175 psi working pressure.

B. Casing: Cast iron, with suction and discharge gage port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Stainless steel with stainless steel impeller cap screw or nut and bronze sleeve.

E. Seal: Mechanical seal, 225 degrees F maximum continuous operating temperature.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Provide line size shut off valve, flexible connection and suction diffuser on inlet to pump.

D. Provide triple duty combination valve flexible connection and line size shut off valve on discharge of pump.

E. Lubricate pumps before start-up.

END OF SECTION

SECTION 233100
HVAC DUCTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

1.2 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

E. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

F. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

G. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

I. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

J. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

K. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.3 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

A. Product Data: Provide data for duct materials and duct connections.

B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for systems.

C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 DESIGN CRITERIA

A. Seal all sheet metal ducts, regardless of pressure class, to SMACNA Seal Class "A".

1.7 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

B. Joint Sealers and Sealants: Type B, Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   3. For Use With Flexible Ducts: UL labeled.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
   6. Other Types: As required.

2.2 CORROSION RESISTANT DUCTS

A. Kitchen Cooking Hood Exhaust: 1 inch w.g. pressure class, galvanized steel.

2.3 DUCTWORK FABRICATION -ALL AREAS EXCEPT LAUNDRY

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. T's, bends, and elbows: Construct according to SMACNA (DCS).

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

F. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

G. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

H. Where ducts are located above ceilings (e.g. ACT, GWB, etc.) reinforced transverse slip joints shall be used to minimize ductwork heights due to flange connections. The

acceptable slip joint types, refer to SMACNA for joint type designations, shall be drive and slip T-3, hemmed "S" slip T-6a and/or double "S" slip T-8a.

2.4 MANUFACTURED DUCTWORK AND FITTINGS - ALL AREAS EXCEPT LAUNDRY

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

B. Flexible Ducts: Black polymer film supported by helically wound spring steel wire.
   1. UL labeled.
   2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
   3. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
   4. Maximum Velocity: 4000 fpm.
   5. Temperature Range: Minus 20 degrees F to 175 degrees F.

2.5 CASINGS

A. Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gage, 0.0478 inch expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

2.6 LAUNDRY EXHAUST DUCTS - MANUFACTURERS

A. Ductmate Industries

B. Metal-Fab, Inc

C. United McGill Corporation

2.7 LAUNDRY EXHAUST DUCT SYSTEMS

A. Round Duct
   1. Aluminum round duct with sleeve connections resulting in no protrusions into the airstream. Ductmate "Quick-Sleeve" or approved equal. Install in accordance with manufacturer's instructions.

B. Rectangular Duct
   1. Aluminum duct, flanged connections, no protrusions into air stream. Ductmate DM35 or approved equal connection system, including an integral neprene gasket and asembly rated at 6": W.G., DC35 corner pieces and all other accessories required for aluminum duct. Provide in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Install ductwork using slip joints, as specified above in section 2.2-H, for areas of reduced construction heights where ceilings are used to decrease the height of duct flanges.

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Seal ductwork to a seal class A level.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

H. Use double nuts and lock washers on threaded rod supports.

I. Connect diffusers or registers to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

3.2 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.3 SCHEDULES

A. Ductwork Material:
   1. Supply Ductwork : Galvanized Steel
   2. Exhaust Ductwork: Galvanized Steel
   3. Outside Air Intake Ductwork: Galvanized Steel.
   4. Laundry Duct - See 2.6, 2.7.

B. All ductwork shall be sealed per Class B sealing requirements in accordance to SMACNA.

C. Ductwork Pressure Class:
   1. Supply ductwork: 2"
   2. Exhaust Ductwork: 2".
   3. General Exhaust: 2".
   4. Outside Air Intake: 2".

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.
B. Backdraft dampers - metal.
C. Combination fire and smoke dampers.
D. Duct access doors.
E. Duct test holes.
F. Fire dampers.
G. Flexible duct connections.
H. Smoke dampers.
I. Volume control dampers.
J. Lint interceptor

1.2 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts.

1.3 MOCKUP OF DAMPER INSTALLATIONS

A. Provide a mock-up for each type of opening protection. All concerned parties shall review and approve the installation before the remaining units are installed.

1.4 REFERENCE STANDARDS

A. NFPA 92A - Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences; 2009.
B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.
C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.
D. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
E. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. See Section 013300 - Submittal Procedures, for submittal procedures.
B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
D. Manufacturer's Installation Instructions: Provide instructions for smoke dampers, fire dampers and combination fire and smoke dampers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:
1. Krueger:

2. Ruskin Company:
3. Substitutions: See Section 016000 - Product Requirements.

B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc:
2. Nailor Industries Inc:
3. Substitutions: See Section 016000 - Product Requirements.

B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc:
2. Nailor Industries Inc:
3. Ruskin Company; Model FSD60LP and FSD60FA:
4. Substitutions: See Section 016000 - Product Requirements.

B. Out of Wall Type:
1. Ruskin FSD60FA or approved equal front access combination fire and smoke damper, UL 555S Leakage class I, 1-1/2 hour rating. Rated for 2000 fpm velocity, 4" static pressure. UL listed to be mounted directly to corridor grille, with access to damper through grille.

C. Shaft Wall/In Wall and Horizontal Type
1. Ruskin FSD60LP or approved equal, combination fire and smoke damper, UL 555S Leakage Class I, 1-1/2 hour rating. Rated for 2000 fpm velocity, 4" static pressure.

D. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

E. Provide factory sleeve and collar for each damper.

F. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

G. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

A. Manufacturers:
1. Nailor Industries Inc:
2. Ruskin Company:
3. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Accwss doors shall be double wall, insulated.

C. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.6 FIRE DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc:
2. Nailor Industries Inc:
3. Ruskin Company; Model DIBD2 Style B:
4. Substitutions: See Section 016000 - Product Requirements.

B. Ruskin DIBD2 or approved equal, 1-1/2 hr. rating. Rated for 4000 fpm velocity, 4" static pressure. Can be installed vertically or horizontally.

C. Type B dampers fabricated in accordance with NFPA 90A and UL 555, and as indicated. All shall be dynamic type with a 165 degree fusible link.

2.7 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
a. Net Fabric Width: Approximately 2 inches wide.
2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

2.8 SMOKE DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc:
2. Nailor Industries Inc:
3. Ruskin Company; Model SD60:
4. Substitutions: See Section 016000 - Product Requirements.

B. Ruskin Model SD60 or approved equal, UL555S Leakage class I, 1-1/2 hour rating. Rated for 2000 fpm velocity, 4" static pressure. With electric actuator. Normally closed, open upon signal from smoke detector. To be used for elevator smoke vent.

C. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

2.9 VOLUME CONTROL DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc:
2. Ruskin Company:
3. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

F. Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.10 LINT INTERCEPTOR

A. Manufacturers:
1. Clean Cycle Systems, Inc:

2. American Aldes Ventilation Corp.:
3. Substitutions: See Section 016000 - Product Requirements.

B. In-Line Lint Filter
1. In line lint filter, Clean Cycle Systems Model LLA-10 or approved equal, fully insulated flame retardant fiberglass casing, cleanable lint sock, access door. Able to be installed in either horizontal or vertical position.
2. Provide with duct transitions to match inlet and outlet of unit (10" inlet, 12" outlet).
3. Provide Owner training in operation and maintenance of unit.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges. install in strict compliance with manufacturer's listing.

F. Install smoke dampers and fire dampers in accordance with NFPA 92A.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing and as noted on drawings. Install minimum 2 duct widths from duct take-off.

K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 233413
AXIAL HVAC FANS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Propeller Wall Fans.

B. High Volume, Low Speed Propeller Ceiling Fans

C. Accessories.

1.2 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.

B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; 1990 (Reapproved 2008).

C. AMCA 99 - Standards Handbook; 2010.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

1.3 SUBMITTALS

A. Product Data: Provide data on axial fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

PART 2 PRODUCTS

2.1 PROPELLER WALL FANS

A. MANUFACTURERS:
   1. ACME Engineering and Manufacturing Corporation
   2. Trane Corporation
   3. Greenheck
   4. Substitutions: See Section 016000 - Product Requirements.

B. Impeller: Shaped steel or steel reinforced aluminum blade with heavy hubs, statically and dynamically balanced, keyed and locked to shaft, directly connected to motor .

C. Frame: One piece, square steel with die formed venturi orifice, mounting flanges and supports, with baked enamel finish.

2.2 HIGH VOLUME, LOW SPEED CEILING PROPELLER FANS

A. MANUFACTURERS:
   1. Delta T Corporation, dba Big Ass Fans Essence
   2. Substitutions: See Section 016000 - Product Requirements.

B. Air Foil:
   1. The fan shall be equipped with eight (8) high volume, low speed airfoils of precision extruded, anodized aluminum alloy. The airfoils shall be connected to the hub and interlocked with eight (8) stainless steel retainers and two (2) sets of stainless steel bolts and lock washers per airfoil.

2. The fan shall be equipped with eight (8) upswept winglets designed to redirect outward airflow downward, thereby enhancing efficiency. The winglets shall be molded of high strength polymer and shall be attached at the tip of each airfoil with a stainless steel screw. The standard color of the winglets shall be silver or black.

C. Motor:
   1. The fan motor shall be a permanent magnet brushless motor rated for continuous operation at maximum speed with the capability of modulating the fan speed from 0–100% without the use of a gearbox or other mechanical means of control. The motor shall be a non-ventilated, heat sink design with the capability of continuous operation in -13°F to 131°F (-25°C to 55°C) ambient condition.

D. Mounting System:
   1. All components in the mounting system shall be of formed metal design using low-carbon steel no less than 3/16" (0.5 cm) thick. The mounting system shall be powder coated for appearance and resistance to corrosion. All mounting bolts shall be metric stainless steel or equivalent.
   2. The fan extension tube shall be a round, extruded aluminum tube. The extension tube shall include a chrome plate with forward and reverse controls and a fan status indicator light that is visible from the floor.

E. Hub
   1. The fan hub shall be constructed of zinc plated steel for high strength and durability. The hub shall be precision machined to achieve a balanced and solid rotating assembly.

F. Safety Cable
   1. Fan shall be equiped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be 3/16" diameter and fabricated out of 7x19 stranded galvanized steel, pre-loaded and tested to 3,200 lbf minimum.

G. Control
   1. Fan shall include a relay for integration with fire alarm panel. The relay shall be wired to shut down fan upon activation of fire alarm.
   2. Wall Controller: Rotary-style dial for controlling the fan's power and speed with an LED light to identify and relay faults in the system. Wall controller shall be hard wired to the fan with low-voltage/Ethernet cable. Low voltage/Ethernet cable to be field installed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate wall openings for propeller wall fans with other trades.

C. Coordinate ceiling mounting and supports for high volume, low velocity ceiling propeller fan with other trades.

END OF SECTION

SECTION 233416
CENTRIFUGAL HVAC FANS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Inline centrifugal fans.

1.2 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; 2010.

B. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.

C. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.3 SUBMITTALS

A. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

B. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Greenheck:

B. Loren Cook Company:

C. Substitutions: See Section 016000 - Product Requirements.

2.2 WHEEL AND INLET

A. Backward Inclined: Aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

B. Forward Curved: steel construction with inlet flange, back plate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; steel hub swaged to back plate and keyed to shaft with set screw.

2.3 HOUSING

A. Heavy gage steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut

B. Galvanized steel housing with bolted construction. Provide with bolted access panels, integral duct connection flange..

2.4 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA STD 9 life at 50,000 hours.

B. Shafts: Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.

C. Drive: Cast iron or steel sheaves, dynamically balanced, keyed and with variable and adjustable pitch sheaves.

D. Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 233700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

C. Louvers.

1.2 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.

B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.3 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Price Industries:

B. Titus:

C. Substitutions: See Section 016000 - Product Requirements.

2.2 CEILING DIFFUSERS

A. See schedules on drawings.

2.3 SUPPLY REGISTERS

A. See schedules on drawings.

2.4 EXHAUST REGISTERS

A. See schedules on drawings.

2.5 LOUVERS

A. See schedules on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 235100
FLUE VENTS AND COMBUSTION AIR DUCTS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ANSI/ASTM F441 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

B. ANSI/ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

C. UL 1738 - Standard for Venting Systems for Gas-Burning Appliances, Categories II, III, and IV

1.2 SUBMITTALS

A. Product Data: Provide data indicating factory flue vents and combustion air intake material, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

B. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of vents and intakes. Submit layout drawings indicating plan view and elevations.

PART 2 PRODUCTS

2.1 FLUE VENTS - GENERAL REQUIREMENTS

A. Regulatory Requirements:
1. Conform to applicable code for installation of natural gas burning appliances and equipment.

2.2 COMBUSION AIR INTAKE

A. Schedule 40 CPVC combustion air intake, with pipe and fittings meeting ANSI/ASTM F441, cement and primer meeting ANSI/ASTM F493.

2.3 CATAGORY IV FLUE VENT

A. metal stacks, tested to UL 1738 and UL listed with positive pressure rating, for use with building heating equipment.

B. Double wall product that consists of a flue-gas conduit fabricated from AL 29-4C. the outer jacket shall be constructed of stainless steel with a one inchy space between the flue-gas conduit and the jacket.

C. Accessories, UL listed and labeled. Provide all elbow, fittings, wall penetrations and termination assemblies required for a complete system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide Catagory IV flue vent and CPVC combustion air intake on natural gas fired water heater - Refer to Plumbing Drawings. Install vent and combustion air intake material in accordance with water heater manufacturer's instructions and flue vent manufacturer's instructions. Provide all fittings and accessories for a complete system installation.

END OF SECTION

SECTION 235700
HEAT EXCHANGERS FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shell and tube type heat exchangers.

B. Plate type heat exchangers.

C. Accessories and trim.

1.2 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

1.3 SUBMITTALS

A. Product Data: Provide data with dimensions, locations, and size of tappings and performance data.

B. Shop Drawings: Indicate dimensions, locations, and size of tappings and performance data.
   1. Design Data: Indicate in sufficient detail to verify that heat exchangers meet or exceed specified requirements.
   2. Test Reports: Indicate tube bundle pressure tests.

C. Manufacturer's Instructions: Indicate installation and support requirements.

D. Coordination Drawing: Include shop drawing of field fabricated heat exchanger support for HE-1 & HE-2 showing coordination with other trades and manufacturer's recommended access for maintenance.

1.4 REGULATORY REQUIREMENTS

A. Conform to ASME (BPV VIII, 1) - Boilers and Pressure Vessels Code for manufacture of tubular heat exchangers and heat exchanger shells.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect internals from entry of foreign material by temporary caps on flanged openings.

PART 2 PRODUCTS

2.1 SHELL AND TUBE TYPE HEAT EXCHANGER

A. Manufacturers:
   1. Yula Corporation or Equal.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Tubes: U-tube type with 3/4 inch OD minimum seamless cupro-nickel (Cu/Ni 90/10) tubes suitable for 400 psi working pressure, 600 psi test pressure and 400 degree F working temperature.

C. Shell: Steel pipe with flanged piping connections and necessary tappings, steel saddle and attaching U-bolts, prime coated.

D. Heads: Fabricated stainless steel with steel or bronze tube sheets, thru bolted heads, and flanged piping connections.

2.2 PLATE AND FRAME TYPE HEAT EXCHANGER

A. Manufacturer:
   1. Alfa Laval
   2. Graham

3. Taco, Inc.
4. Substitutions: See Section 016000 - Product Requirements.

B. General: Brazed plate construction, consisting of stainless steel plates, embossed with a heat transfer surface. 350 Maximum working temperature, 450 Maximum working pressure. Heat exchanger shall be UL listed and ASME certified. Heat exchanger shall have stud bolts for mounting.

C. Plates: Stainless steel Type 316. The plates to be vacuum brazed together with copper brazing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support plate and frame heat exchangers from structure, shell and tube as indicated on drawings.

C. Pipe relief valves to nearest floor drain.

3.2 WATER TO WATER HEAT EXCHANGER TRIM

A. Water Inlets and Outlets: Thermometer wells, pressure gage tappings.

B. Heated Water Outlet: Thermometer well for temperature regulator sensor, ASME rated pressure and temperature relief valve, valved drain; refer to Section 232114 and 232116.

END OF SECTION

SECTION 237201
AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Related Sections include the following:
1. Section 23 0993 - "Sequence of Operations for HVAC Controls".

1.2 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities of selected model clearly indicated; dimensions; required clearances; shipping, installed, and operating weights; furnished specialties; accessories; and installation and startup instructions.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 QUALITY ASSURANCE

1.4 ENERGY RECOVERY UNITS (ERU1 AND ERU2)

A. Description:
1. Factory assembled and tested unit with recovery wheel, supply fan, exhaust fan, filters, dampers and factory controls. Refer to drawing schedule for additional information. ERU1 and ERU2 to include glycol heating coil.

B. Construction:
1. All cabinet walls, access doors, roof and floor shall be a high performance composite panel constructed with G90 galvanized steel on both sides and a closed cell polyurethane foam interior core providing a rigid, impact resistant surface.
2. Diagrams shall also be laminated in plastic and permanently affixed inside the control compartment.
3. Access to filters, heating section, and other items needing periodic checking or maintenance shall be through hinged access doors with quarter turn lockable handles. Door fastening screws are not acceptable. The blower access door shall be bolted closed.
4. Access doors shall have full-length stainless steel hinges and full perimeter gasketing.
5. All openings through the base pan of the unit shall have upturned flanges of at least ½" in height around the opening through the base pan.
6. Unit shall have decals and tags to indicate unit lifting and rigging, service areas and caution areas. Installation and maintenance manuals shall be supplied with each unit.

C. Supply and Exhaust Fans:
1. Fans attached to 1760 rpm motors shall be rated for a minimum of 1800 RPM maximum speed.
2. Fan(s) and motor(s) shall be dynamically balanced, and the entire fan assembly mounted on rubber isolators.
3. VFD drive shall be factory mounted and wired to the fan motor.
4. Motors shall be premium efficiency. Motors for use with a VFD shall be premium efficiency inverter rated only. Motors shall have ball bearings rated for 200,000 hours service and external lubrication connections.

D. Energy Recovery:

1. Unit shall have a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings.
2. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.
3. The energy recovery component shall include integral bypass dampers to allow air to bypass the energy recovery wheel during economizer mode.
4. The energy recovery component shall have a maximum Exhaust Air Transfer Ratio (EATR) equal to 4.0% maximum leakage.

E. Filters:
1. All other model sizes shall have 2" thick fiberglass pleated filters with an ASHRAE efficiency of 90% and a MERV rating of 13.
2. Options:
a. Clogged filter switch
b. Direct dial reading Magnehelic gauge mounted in the controls compartment.

F. Vibration isolation:
1. Unit shall be isolated from concrete pad with 1" thick neoprene pads.

G. Heating Coils
1. Copper fins, galvanized steel casing, 5/8" tubes. Two row, 12 fins per inch coil, 2-5/8" connection

H. Controls - Refer to specification section 230993 for additional information.
1. The unit shall be equiped with the following factory controls:
a. Defrost Mode based on exhaust air temperature.
1) During defrost mode (i.e. exhaust air temperature is below setpoint), the energy recovery wheel shall be stopped for a brief factory programmed peroid of time. The defrost "ON" temperature shall be adjustable through the unit controls.
b. Energy recovery wheel bypass damper actuators and wheel rotation interrupt contact. - controlled by the BAS for economizer mode.
1) Damper actuators and interrupt contact shall be factory installed and wired. Control of these devices shall be through interface with the BAS.
c. VFD's on the supply and return fans.
1) VFD's shall be factory wired and installed. Control (enable and disable) of fans shall be through interface with the BAS.
d. Wheel rotation verification contact - monitored by the BAS.
1) Wheel rotation contact shall be factory wired and installed. Monitoring of the wheel rotation shall be through interface by the BAS.

PART 3 - EXECUTION

2.1 GENERAL:

A. Install unit per manufacturer's recommendations.

END OF SECTION

SECTION 237202
SMALL AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. The energy recovery unit is a floor mounted air pre-conditioner utilizing an energy wheel to reduce the heating and cooling load placed on the HVAC unit by untreated outdoor air. The energy recovery unit will have exhaust and supply air provided through ducts directly attached to the unit.

1.2 QUALITY ASSURANCE

A. Unit shall be designed in accordance with UL Standard 1995.

B. Unit shall be ETL tested and certified.

C. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

PART 2 - PRODUCTS

2.1 MANUFACTUERS

A. Manufacturers: Subject to strict compliance with the requirements of this specification, provide products by one of the following:
   1. Venmar CES Inc.
   2. Semco
   3. Systemair
   4. Ruskin

2.2 EQUIPMENT (ERU3)

A. General
   1. The ERV unit shall be a factory assembled, single piece unit. Contained within the unit enclosure shall be all factory wiring with a single, pre-determined point of power input and a single point of 24 volt control wiring.

B. Unit Cabinet
   1. Unit cabinet shall be constructed of G90 galvanized, 20 gauge steel coated with a prepainted baked powder paint finish. Unit casing shall include 1 inch fiberglass insulation.
   2. Exhaust and supply air streams shall have factory supplied motorized dampers to prevent air penetration during off cycles.

C. Fan Section
   1. Unit shall included separate fans for exhaust and supply air streams.
   2. Fans shall be backward inclined.
   3. Fan motors shall be premium efficiency and shall have permanently lubricated sealed bearings and thermal overlad protection.

D. Filter Section
   1. Standard filter section shall consist of any commercially available, 2 inch pleated filters, MERV 13.

E. Electrical and Control Requirements
   1. All unit power wiring shall enter unit cabinet at a single location.
   2. Unit shall include wheel rotation sensor, exhaust and outside air dampers, defrost control, and disconnect switch.
   3. Provide with required termianl strip, contactors, relays and accessories to enable the unit to be controlled by the BMS system.

F. Energy Recovery Wheel
   1. Energy recovery wheel shall be enthalpy type certified in accordance with ARI Standard 1060.
   2. Wheel shall be made of corrosion resistant aluminum alloy composed of alternating corrugated and flat layers of uniform width. The surface shall be coated with a thin non-migrating absorbent layer.
   3. Wheel shall conform to the requirements of NFPA 90A and have a smoke developed rating of no more than 50 and a flame sjpread of no more than 25.
   4. Wheel cassette shall be complete with face seal and perimeter seal to minimize air transfer between air streams.

G. Controls - Refer to specificatoin section 230993 for additional information.
   1. The unit shall be equiped with the following factory controls:
      a. Defrost mode based on low ambient air temperature. Unit shall activate the unit mounted pre-heater when outside air temperature is below 7 degrees F. and operate it until the low air temperature/frost condition ceases.
      b. start/stop economizer mode on energy recovery wheel based on outside air temperature.
      c. Wheel rotation control and rotation sensor - signalled and monitored by the BAS
      d. Supply and Return Fan start/stop controlled thru a signal from the BAS

H. Defrost Pre heater
   1. Provide electric defrost pre-heater, see drawings schedule for parameters.
   2. the defrost heater is controlled by internal unit controls.

I. Accessories:
   1. As scheduled on drawings.

PART 3 - EXECUTION

3.1 GENERAL:

A. Install energy recovery unit per manufacturers recommendations

END OF SECTION

SECTION 238101
TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finned tube radiation.

B. Unit heaters.

C. Cabinet unit heaters.

1.2 RELATED REQUIREMENTS

A. Asbestos and PCBs must be abated completely prior to any task unless demolition is required to access the asbestos or PCBs. If asbestos or suspected hazardous materials are discovered and/or disturbed, cease operations and notify Owner and Owner's Representative immediately.

1.3 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

B. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.,

C. Manufacturer's Instructions: Indicate installation instructions and recommendations.

D. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

PART 2 PRODUCTS

2.1 FINNED TUBE RADIATION

A. See schedule on drawings.
   1. Sterling/Mestek, Inc.: www.sterlingheat.com.
   2. Slant/Fin Corporation: www.slantfin.com.
   3. Marley Engineered Products: www.marleymep.com.

B. Heating Elements: 1 inch ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized 4-1/4 inch x 3-5/8 inch, suitable for soldered fittings.

C. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

D. Enclosures: 14 gauge, 20" tall, steel enclosure with sloped stamped louver top. Support rigidly on wall mounted brackets at least 3 feet on center maximum.

E. Finish: Factory applied baked enamel of color as selected by Architect.

F. Access Section: 12" wide removeable access section on each end of the fin tube enclosure for access to valves and accessories. Access section shall be constructed of the same material as the enclosure and shall utilize a compression seam at joint between main enclosure and 12" wide removeable access section.
   1. Provide permenant label on access section located in front of fin tube control valve.

G. End Caps: Overlapping end caps to provide continuous enclosure from wall to wall. End caps shall include bottom returns with prepunched holes for fastening to wall.

H. Capacity as scheduled, based on 65 degree F. entering air temperature; see schedule on drawings fot water temperatures.

2.2 UNIT HEATERS

A. See schedule on drawings:
   1. Slant/Fin Corporation: www.slantfin.com.
   2. Sterling Hydronics/Mestek Technology, Inc: www.sterlingheat.com.

B. Coils: Seamless copper tubing, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

C. Casing: 20 Guage die formed steel.

D. Finish: Factory applied baked resin base with electrostatic 2 pass system primer coat.

E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

F. Air Outlet: Adjustable pattern diffuser on projection models and two way louvers on horizontal throw models.

G. Motor: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models.

H. Control: Local disconnect switch.

I. Capacity: As scheduled based on 60 degree F. entering air temperature, see schedule on drawings for water temperatures.

2.3 CABINET UNIT HEATERS

A. See schedule on drawings.
   1. Slant/Fin Corporation: www.slantfin.com.
   2. Sterling Hydronics/Mestek Technology, Inc: www.sterlingheat.com.
   3. The Trane Company:

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes.

C. Cabinet: Construct cabinets with 18 gauge cold rolled steel sides and top panels. Front panels shall be 16 gauge cold rolled steel.

D. Provide cabinet type, surface, recessed as scheduled on drawings.

E. Finish: Factory applied baked primer coat with optional powder coated baked enamal on enclosure or cabinet. Color as selected by Architect from standard colors.

F. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

G. Control: Multiple speed switch, factory wired, located in cabinet.

H. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

I. Capacity as scheduled on drawings see schedule for conditions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Finned Tube Radiation: Locate on outside walls and run cover wall-to-wall unless otherwise indicated. Center elements under windows. Install access panels on each end of main enclouse. Locate access panels in front of valves on each side of element. Install end caps where units butt against walls.

E. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

F. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.

3.2 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

C. Install new filters.

END OF SECTION

SECTION 238127
SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air-source heat pumps.

B. Indoor ductless fan & coil units.

C. Controls.

1.2 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The Mitsubishi Corporation:

B. The Trane Company:

C. Substitutions: See Section 016000 - Product Requirements.

2.2 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.

1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with factory insulation. All shall use R410A refrigerant.

2.3 INDOOR UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.

1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.

C. Accessories: Provide manufacturer's standard integral condensate pump.

2.4 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Refrigerant: R-410A.
   2. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
   3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

C. Coil: Air-cooled, aluminum fins bonded to copper tubes.

D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line) and pre-charged refrigerant line sets. Refrigerant line sets shall be provided with a minimum of 1" of flexible elastomeric cellular insulation sealed vapor tight.
   1. Provide thermostatic expansion valves.
   2. Provide heat pump reversing valves.

E. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units.

B. Verify that proper power supply is available and in correct location and is of the correct electrical characteristics.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

3.3 TESTING

A. Test each field installed refrigerant piping system in accordance with the Mechanical Code of New York State. Every refrigerant-containing part of each system that is erected under this scope of work shall be tested and proved tight after complete installation and before operation. Tests shall include both the high and the low-pressure sides of each system. Initial test shall be at not less than the design pressure of the system or a minimum of 20psig to verify joint integrity. Final test shall be at not less than the design pressure of the system or the setting of the pressure relief device at full charge.
   1. Exceptions: Compressors, condensers, vessels, evaporators, safety devices, pressure gauges and control mechanisms that are listed and factory tested are not required to be tested under the requirements of 3.3.A above.

END OF SECTION

SECTION 238216
AIR COILS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glycol hot water coils.

1.2 REFERENCE STANDARDS

A. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; 2001 (R2011).

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.3 SUBMITTALS

A. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

B. Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

C. Certificates: Certify that coils are tested and rated in accordance with ARI 410.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

B. Protect coils from entry of dirt and debris with pipe caps or plugs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Aerofin Corporation:

B. The Trane Company:

C. AAON, Inc.

D. Substitutions: See Section 016000 - Product Requirements.

2.2 GLYCOL HEATING COILS

A. Tubes: 5/8 inch OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.

B. Fins: Aluminum or copper continuous plate type with full fin collars.

C. Casing: Die formed channel frame of 16 gage galvanized steel with 3/8 inch mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.

D. Headers: Cast iron with tubes expanded into header.

E. Testing: Air test under water to 200 psi for working pressure of 200 psi and 220 degrees F.

F. Configuration: Drainable, with threaded plugs in headers for drain and vent

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers written instructions.

B. Install in ducts and casings in accordance with SMACNA (DCS).

1. Support coil sections independent of piping on steel channel or double angle frames and secure to casings.
2. Provide airtight seal between coil and duct or casing.

C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

D. Make connections to coils with unions and flanges.

E. Hydronic Coils:
   1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
   2. Ensure water coils are drainable and provide drain connection at low points.

END OF SECTION

SECTION 240100
COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Commissioning is a systematic process of verifying that all building systems perform interactively according to the owner's operational needs, the design documents, manufacturer's recommendations, and good engineering and workmanship practices. This is achieved by beginning in the design phase and understanding the owner's requirements and continuing through construction, acceptance and the warranty period with actual verification of performance.

B. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
   1. Verify that applicable equipment and systems are installed according to the contract documents, manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by contractors.
   2. Verify and document proper performance of equipment and systems.
   3. Verify that O&M documentation provided for the project is complete, accurate and represents the actual installed equipment.
   4. Verify that the Owner's operating personnel are adequately trained.

C. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

D. Abbreviations: The following are common abbreviations used in the Specifications. Definitions are found in Article 1.3.

A/E -	Architects and Design Engineers	EC -	Electrical Representative
CxA -	Commissioning Authority	FT -	Functional Performance Test
CTR -	Contractors	CM -	Construction Manager
Cx -	Commissioning	MC -	Mechanical Representative
Cx Plan -	Commissioning Plan Document	PFI -	Pre-Functional Inspection
PC -	Plumbing Representative	PM -	Project Manager (of the owner)
		TAB -	Test and Balance Contractor

1.3 DEFINITIONS

A. Acceptance Phase – Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Acceptance Criteria – The criteria established by the Owner and design team which defines the specified requirements that a component or system must meet under all ranges of actual loads. The CxA's pre-functional inspections and functional testing determines if the acceptance criteria have been met.

C. Approval – Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

D. Architect/Engineer (A/E) – The prime consultant (architect) and subconsultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

E. Building Systems – The architectural, mechanical, electrical, plumbing and control systems along with their respective subsystems, equipment and components.

F. Basis of Design – The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the owner's requirements. The basis of design describes the systems, components, conditions and methods chosen to meet the owner's requirements.

G. Commissioning – A quality control process that verifies that specified components and building systems have been installed, properly started up and then functionally tested to verify and document proper operation through all specified modes of operation and conditions, all of which shall perform in conformity with the owner's requirements. In addition, training of operations and maintenance personnel, identified by the owner, is verified, and final project operations and maintenance documents are reviewed for completeness.

H. Commissioning Agent (CA): The Contractor. For the purposes of commissioning the Contractor shall assume the role, tasks, and responsibilities of the Commissioning Agent. Note that per the Owner's Building Commissioning Guidelines, the Owner does not allow the Commissioning Authority and Commissioning Agent to be the same organization or person. The Commissioning Agent shall assign a representative with expertise and authority to act on its behalf to participate in the commissioning process.

I. Commissioning Authority – The owner's representative that verifies the commissioning process is properly carried out. The Commissioning Authority leads the commissioning process, executes the detailed planning and implementation of the commissioning process and makes final recommendations to the owner regarding the performance of the commissioned building systems. The Commissioning Authority is Genesys Engineering for this particular project.

J. Commissioning Plan – An overall plan, which provides the structure, schedule and coordination planning for the commissioning process.

K. Construction Manager (CM) – An organization whose role is to manage the construction team and various contractors to build and test the building systems for the project. The Construction Manager also works with the Commissioning Authority to identify and correct any deficiencies.

L. Contract Documents – The documents binding parties involved in the construction of the project (drawings, specifications, change orders, amendments, contracts, Cx Plan, etc.)

M. Contractors (CTR) – The company(s) engaged by the Owner or CM to provide and/or install equipment and building systems in accordance with the contract specifications, drawings, manufacturer's recommendations and good engineering and workmanship practices.

N. Datalogging – Monitoring flows, currents, status, pressures, etc., of equipment using stand-alone dataloggers separate from the control system.

O. Deferred Functional Tests – FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that prevent the test from being performed.

P. Deficiency – A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Q. Design Narrative or Design Documentation – sections of either the Owners Project Requirements or Basis of Design.

R. Factory Testing – testing of equipment on site or at the factory by factory personnel with or without an Owner's representative present. The contractor furnishing the equipment is responsible for providing all testing documentation as per the contact documents.

S. Functional Performance Test (FT) – Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g. the hot water pump is tested interactively with the perimeter heat system to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. The Commissioning Authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is performed in conjunction with the installing contractor or vendor. FTs are performed after pre-functional inspections and startup is complete.

T. Functional Testing Procedures – The step-by-step process that must be executed to fulfill the functional testing requirements. The test procedures are developed by the CxA.

U. Indirect Indicators – Indicators of a response or condition, such as a reading from a controls system screen reporting a damper to be 100% open.

V. Manual Test – Using hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation.")

W. Monitoring – The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

X. Non-Compliance – See Deficiency.

Y. Non-Conformance – See Deficiency.

Z. Owner Contracted Tests – Tests paid for by the Owner outside the CTR's or CM's contract and for which the CxA does not oversee. These tests will not be repeated during functional tests if properly documented.

AA. Operations and Maintenance (O&M) Manual – The document that records the information pertinent to the operations and maintenance of the components, equipment, subsystems, and systems for the building.

BB. Pre-functional Inspections (PFI) – A list of the items, provided by the CxA to the CTRs, to inspect and elementary component tests to conduct to verify proper installation of equipment. Pre-functional inspections are primarily static inspections and procedures to prepare the equipment or system for initial operation. However, some pre-functional inspection items entail simple testing of the functionality of a component, a piece of equipment or system. The word pre-functional refers to before functional testing. Pre-functional inspections augment and are combined with the manufacturer's startup checklists. Even without a commissioning process, contractors typically perform some, if not many, of the pre-functional inspection items a Commissioning Authority will recommend. However, few contractors document in writing the execution or results of these inspected items.

CC. Project Manager (PM) – The contracting and managing authority for the owner over the design and/or construction of the project.

DD. Sampling – Performing PFIs or functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

EE. Seasonal Performance Tests – FTs that are deferred until the system(s) will experience conditions closer to their design conditions.

FF. Simulated Condition – Condition that is created for the purpose of testing the response of a system (e.g. applying a hair blower to a space sensor to see the response in a VAV box).

GG. Simulated Signal – Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate a sensor value.

HH. Specifications – The construction specifications of the Contract Documents.

II. Startup – The initial starting or activating of dynamic equipment, including executing pre-functional inspections.

JJ. Subs – The sub-contractors to the prime contractors or CM who provide and install building components and systems.

KK. Trending – Monitoring using the building control system or stand-alone datalogging equipment.

LL. Vendor – Supplier of equipment.

MM. Warranty Period – Warranty period for specific equipment and components. Warranties are defined in the appropriate sections of these specifications.

1.4 COORDINATION

A. Commissioning Team: The members of the commissioning team consist of the owner (SUNY New Paltz), DASNY, Commissioning Authority (CxA), the owner's Project Manager (PM) and/or designated representative of the owner, the Construction Manager (CM), the architect and design engineers, the Mechanical Representative (MC), the Electrical Representative (EC), the Plumbing Representative (PC), the TAB representative, the Controls Representative (CC), any other contractors or suppliers of equipment. The Owner's building or plant operator/engineer is also a member of the commissioning team

B. Management: The CxA was hired by DASNY. The CxA directs and coordinates the commissioning activities and reports to the Owner and/or the PM. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling: The CxA will work with the PM and/or CM according to established protocols to schedule the commissioning activities. The CM will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.5 COMMISSIONING PROCESS

A. Commissioning Plan: The Commissioning Plan will be provided by the CxA subsequent to contractor selection and will be binding on the Contractor. The Commissioning Plan is a dynamic document that will provide direction throughout the commissioning process. The plan puts a significant emphasis on defining roles and responsibilities and establishing communication protocols. The plan will be amended as the construction progresses to include updated schedules, pre-functional inspection items and functional testing procedures. The Specifications will take precedence over the Commissioning Plan.

B. Commissioning Process: The following narrative provides a brief overview of the typical commissioning tasks performed during construction and the general order in which they occur:

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout the construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve any problems.
3. Equipment documentation is submitted to the CxA during the normal submittals process and is performed concurrently with the A/E's submittal review process, including detailed start-up procedures.
4. The CxA works with the CM and the contractors in reviewing and incorporating their startup plans and startup documentation into the pre-functional inspections and functional testing procedures.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to system and intersystem levels with pre-functional inspections being completed before functional testing.
6. The CTRs, under their own direction, execute and document the initial checkout, equipment start-up and certification that the equipment is ready for pre-

functional inspections and functional testing. If required by the CxA, this certification will be accomplished in a phased approach under the direction of the CxA. The CxA may witness the start-up of selected equipment.

7. The CxA develops specific equipment and system functional performance test procedures. The CM and/or CTRs review and, if necessary, recommend modifications to the procedures.
8. The procedures are executed by the CTRs, under the direction of, and documented by the CxA.
9. Items of non-compliance in material, installation or setup are corrected at the CTRs expense and the system retested.
10. The CxA records the deficiencies and maintains a database detailing and tracking the correction of deficiencies identified during the Cx process and distributes these reports to the CM and CTRs.
11. The CxA reviews the O&M documentation for completeness.
12. Commissioning is completed before acceptance.
13. The CxA reviews, and observes training provided by the CTRs and the manufacturer's services representatives and verifies that it was completed.
14. The CxA performs a warranty phase review and conducts deferred testing as specified or required.

1.6 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. Trade specific commissioning responsibilities and reporting requirements are provided in the following sections:

Section 019113 – General Commissioning Requirements
Section 220800 – Commissioning of Plumbing Systems
Section 230800 – Commissioning of HVAC Systems
Section 260800 – Commissioning of Electrical Systems

1.7 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. Further specific responsibilities, when required, of the mechanical representative, TAB, controls representative, plumbing representative and those of the electrical representative are described in their particular contract specifications and documents. It is noted that the services for the owner's Project Manager, Architect, HVAC mechanical and electrical designers/engineers and Commissioning Authority are not provided for in this contract. That is, the Contractor is not responsible for providing their services, and those responsibilities are listed here only for clarification of the commissioning process.

B. All Parties

1. Follow the Commissioning Plan.
2. Attend the commissioning scoping meeting and additional meetings as necessary.

C. Architect (A/E)

1. Construction and Acceptance Phase

a. Attend the commissioning scoping meeting and selected commissioning team meetings.
b. Understand and follow the Commissioning Plan.
c. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
d. Provide the Basis of Design documentation.
e. Provide any design narrative documentation requested by the CxA.
f. Coordinate resolution of design non-conformance and design deficiencies identified during commissioning.
g. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
h. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

D. Mechanical and Electrical Designers/Engineers (A/E)

1. Construction and Acceptance Phase

a. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. On site observation should be completed just prior to system startup.
b. Provide any design narrative and sequences documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
c. Attend commissioning scoping meetings and other selected commissioning team meetings.
d. Understand and follow the commissioning plan.
e. Participate in the resolution of system deficiencies identified during commissioning as necessary.
f. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
g. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning.

E. Commissioning Authority (CxA)

1. The CxA is not responsible for design concept, design criteria, compliance with codes, design or construction scheduling, cost estimating, or construction management. The CxA may assist with problem solving non-conformance or deficiencies, but ultimately that responsibility resides with the CM and A/E. The primary role of the CxA is to develop and coordinate the execution of the Commissioning Plan, observe and document system performance. Specifically, that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractor will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA.
2. Construction and Acceptance Phase

a. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized

documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.

b. Coordinate the commissioning work and, with the CM and CTRs, verify that commissioning activities are being scheduled into the master schedule.
c. Revise the Commissioning Plan as necessary.
d. Plan and conduct a commissioning scoping meeting.
e. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
f. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
g. Review equipment submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
h. Write and distribute pre-functional inspections.
i. The CxA will provide the CM and contractors a list of the required submittals. The Contractor bears all costs associated with providing the requested submittals to the CxA without any additional cost to the Owner, CxA or others.
j. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
k. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
l. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
m. With necessary assistance and review from the CM and contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing.
n. Perform pre-functional inspections by selected equipment inspections, site observation and spot-checking.
o. Evaluate systems startup procedures by reviewing start-up reports and by selected site observation.
p. Review TAB execution plan.
q. Execute, with the assistance of the CM and/or contractors, functional testing of the control system before, or in conjunction with, the HVAC system TAB. Coordinate retesting as necessary until satisfactory performance is achieved.
r. Review air and water systems TAB by spot testing, by reviewing completed reports and by selected site observation after receiving the final TAB report.
s. Analyze any functional performance trend logs and monitoring data to verify performance.
t. Maintain a master deficiency and resolution log and a separate testing record. Provide the CM, PM and contractors with written progress reports and test results with recommended actions.
u. Review equipment warranties to verify that the Owner's responsibilities are clearly defined.
v. Oversee and approve the training of the Owner's operating personnel.
w. Compile and maintain a commissioning record and Systems Energy Manual.

x. Review the preparation of O&M manuals.
y. Provide a final commissioning report.
z. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
aa. Return to the site at 10 months into the 12-month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
bb. Identify any warranty phase deficiencies and provide detailed documentation to the Contractor.

F. Owner's Project Manager (PM)

1. Construction and Acceptance Phase

a. Manage the contract of the A/E, CM and CxA.
b. Provide final approval for the completion of the commissioning work.
c. Address any seasonal or deferred testing and any deficiency issues.

G. Construction Manager (CM)

1. Construction and Acceptance Phase

a. Include the cost of supporting commissioning in the contract price.
b. Attend a commissioning scoping meeting and other commissioning team meetings.
c. Furnish a copy of all construction documents, addenda, change orders and submittals and shop drawings related to commissioned equipment to the CxA. The CxA will forward a request to the CM for copies of the submittals that the CxA is required to review concurrently with the engineer as required by the LEED guidelines. The Contractor bears all costs associated with providing the requested submittals to the CxA without any additional cost to the Owner, CxA or others.
d. Provide the requisite readiness notification to the CxA for equipment pre-functional inspections and functional testing utilizing forms provided by the CxA.
e. Participate in pre-functional inspections, startup and functional testing of all equipment, as directed by the CxA.
f. Review the functional performance test procedures submitted by the CxA, prior to testing.
g. Review commissioning progress and deficiency reports.
h. Coordinate the resolution of deficiencies identified by the CxA.
i. Document the completion and/or action taken for the resolution of deficiencies as directed by the CxA and described in the Cx Plan utilizing forms provided by the CxA.
j. Coordinate and perform the training of owner personnel. Notify the CxA when training will be taking place.
k. Ensure that all contractors execute their commissioning responsibilities according to the Contract Documents and schedule.

l. Prepare O&M manuals, according to the Contract documents, including clarifying and updating the original sequences of operation to as-built conditions.
m. Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
n. Ensure that contractors execute seasonal or deferred functional performance testing, witnessed by the CxA, according to the specifications.
o. Ensure that contractors correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

H. Contractors (CTRs)

1. Construction and Acceptance Phase

a. Attend all commissioning scoping meetings and other commissioning team meetings.
b. Provide the requisite readiness notification to the CM for equipment pre-functional inspections and functional testing.
c. Participate in pre-functional inspections, startup and functional testing of all equipment, as directed by the CxA.
d. Review the functional performance test procedures submitted by the CxA, prior to testing.
e. Review commissioning progress and deficiency reports.
f. Coordinate the resolution of deficiencies identified by the CxA.
g. Document the completion and/or action taken for the resolution of deficiencies as directed by the CxA and described in the Cx Plan.
h. Coordinate and perform the training of owner personnel.
i. Prepare O&M manuals, according to the Contract documents, including clarifying and updating the original sequences of operation to as-built conditions.
j. Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
k. Ensure that seasonal or deferred functional performance testing is executed and witnessed by the CxA, according to the specifications.
l. Ensure deficiencies are corrected and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

I. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment commissioning with CTRs as per the contract documents.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor.
4. Provide the information requested by the CxA regarding equipment sequences of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.

1.8 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. The Owner and the CxA reserves the right to amend this list at anytime during the construction and acceptance process.

HVAC

1. Air Compressor
2. Automated Control Systems
3. Ductwork
4. Energy Recovery Units
5. Exhaust and Supply Fans
6. Glycol Feed System
7. Heat Exchangers
8. Heating Coils
9. Hot Water Pumps
10. Hydronic Water Piping, Valves and Accessories
11. Perimeter Radiation and Radiant Floor
12. Split A/C Units
13. Unit Heaters, Cabinet Unit Heaters and Convectors

Plumbing

1. Gas Fired Domestic Hot Water Heaters
2. Domestic Hot Water Circulation Pumps
3. Domestic Water Booster Pump
4. Domestic Water Fixtures and Mixing Valves
5. Instantaneous Domestic Hot Water Heater
6. Sump Pump

Electrical

1. Lighting and Lighting Controls
2. Electrical components associated with HVAC and Plumbing equipment including VSDs and motor controllers.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested.

B. Special equipment, tools, instruments, (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents, shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CxA.

C. Datalogging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting – The CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan to its final version, which will also be distributed to all parties.

B. Pre-functional Inspection (PFI) Meeting – The CxA will schedule, plan and conduct a PFI meeting with the entire commissioning team in attendance to kickoff the PFI phase.

C. Functional Testing (FT) Coordination Meeting – The CxA will schedule, plan and conduct a functional testing coordination Meeting with the entire commissioning team in attendance to kickoff the FT phase. It may also be necessary for the Testing and Balancing contractor to attend this meeting.

D. Miscellaneous Meetings – Progress meetings will be scheduled and conducted by the CxA, as necessary. Other meetings will be planned and conducted by the CxA as the construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular CTRs. The CxA will plan these meetings and will minimize unnecessary time being spent by CTRs.

3.2 REPORTING

A. The CxA will provide regular reports to the Owner, PM, CM, and A/E depending on the management structure, with increasing frequency as construction and commissioning progresses.

B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised for commissioning progress, and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report by the CxA will be provided to the Owner. The report will include:

1. A brief summary report that includes a list of participants and roles, brief building description, overview of commissioning and testing scope, and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the CxA regarding the adequacy of the equipment, documentation, and training meeting the contract documents in the following areas:
    a. Equipment meeting the equipment specifications
    b. Equipment installation
    c. Functional performance and efficiency
    d. Equipment documentation
    e. Operator Training
2. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment and operations, future actions, recommended commissioning process changes, etc. shall also be listed.

3. Also included in the Commissioning Record shall be the issues log, commissioning plan, progress reports, submittal and O&M manual reviews, training record, test schedules, construction checklists, start-up reports, functional tests and trend log analysis.

E. The CxA will compile a Systems Manual that consists of the following:

1. Space and use descriptions
2. Single line drawings and schematics for major systems (to be provided by the design engineer)
3. Control drawings and sequences of control (to be provided by the controls contractor)
4. Table of all setpoints and implications when changing them
5. Schedules
6. Instructions for operation of each piece of equipment for emergencies, seasonal adjustment, startup and shutdown
7. Instructions for energy savings operations and descriptions of the energy savings strategies in the facility
8. Recommendation for recommissioning the facility
9. Energy tracking recommendations

3.3 SUBMITTALS

A. The CxA will provide the CM with a specific request for the type of submittal documentation the CxA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At a minimum the request will include the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CxA. All documentation requested by the CxA will be included by the CTRs in their O&M manual contributions.

B. The CxA will review submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The CxA will notify the Owner, PM, CM or A/E as requested, of items not included or areas that are not in conformance with Contract Documents and which require resubmission. The CxA does not have approval responsibility but is required to review the submittals concurrently with the engineer as required by LEED guidelines.

C. The CxA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CxA will review them.

E. The CxA shall review the submittals once. The CxA shall receive a copy of the final approved submittals.

3.4 SYSTEM START-UP AND TESTING

A. General Requirement

1. All systems and system components shall be tested by the CTRs and in the presence of the Owner and Design Consultants if desired by the Owner and Design Consultants to demonstrate compliance with specified requirements. To minimize the time of commissioning, contracting, and Design Consultant team members, testing shall be done in seasonal single blocks of time insofar as possible.
2. The Contractors shall notify the CxA fourteen (14) days prior to scheduled functional performance tests, of the scheduled completion date of the installation verification and pre-functional inspections.
3. All testing shall be conducted under specified design operating conditions as approved by the CxA and Design Consultants.
4. All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on a hierarchical basis. Each piece of equipment shall be tested for proper operation, and functionality of safety devices, followed by each system's subsystem, followed by the entire system, followed by any interlocks to other major systems.
5. All special testing materials and equipment shall be provided by the CTR. This includes, but is not limited to, proprietary equipment, hand-held control parameter/setpoint adjustment tools, water/air flow balancing readout and adjustment tools.
6. One copy of all factory test reports and records as well as all start-up documentation shall be provided to the CxA.

B. Test Procedure Development and Test Documentation

1. At least fourteen (14) days prior to startup of the mechanical system, the CTR shall inform the CxA, the Owner's representative and Design Consultants of the intention to start up the system.

C. Installation Verification Requirements

1. All systems and system components shall be checked and verified by the CTR that they have been installed according to the drawings, specifications, and manufacturer's written instructions, and that all connections have been made correctly. Discrepancies shall be corrected and resolved to the satisfaction of the engineer and CxA prior to proceeding any further with pre-functional inspections.
2. Each system of interlocked system components shall be observed and verified by the CTR that it is ready to function as specified.
3. Verification of complete and proper installation shall be completed prior to the CxA authorizing functional performance testing.
4. The installation verification shall be documented by the CTR in a written format for each system/piece of equipment as designated by the CxA. Each certificate of readiness shall be dated and initialed by the Contractor and clearly stating any items that are deficient or have not been completed. The protocols for this will be further clarified in the Commissioning Plan.

D. Pre-functional Inspection Requirements

1. The CxA will provide the inspection forms for each system and equipment.
2. Completion of the pre-functional inspections is the responsibility of the CxA.

3. Prior to the CxA performing the pre-functional inspection, the CTRs shall check the equipment for proper installation, adjustments, and shall calibrate the equipment to verify that it is ready to perform as specified.
4. Verification of complete and proper installation shall be completed prior to performing functional performance tests.

E. Functional Performance Testing Requirements

1. A functional performance test shall be performed on each complete system. Each function shall be demonstrated to the satisfaction of the CxA based on the written test procedure developed by the CxA to demonstrate conformance to the requirements of the Contract Documents.
2. Each functional performance test shall be performed, witnessed and signed off by the CxA. The CxA and the CTRs will perform the functional testing together. Any exceptions to this will be made clear to the Owner as to the reason and justification.
3. The functional performance testing shall be conducted in accordance with prior approved procedures and documented as required.
4. The Contractor shall notify the contracting team, the CxA, and Design Consultants, at least two weeks prior to the date of schedule functional performance tests. The seasonal functional performance test periods shall be scheduled over a single block of days. The schedule of functional performance tests shall be based on the construction completion schedule.

3.5 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation – The CxA shall witness and document the results of all functional performance tests using the specific forms developed by the CxA for that purpose.

B. Non-Conformance
1. The CxA will record the results of the PFIs and functional tests utilizing the appropriate documentation. All deficiencies or non-conformance issues shall be noted and reported to the Owner, PM, CM, A/E and CTRs.
2. Reports of the deficiencies identified will be provided to the project team by the CxA. Individual forms identifying the deficiencies for each trade will also be provided. These forms are utilized for the contractor to inform the CxA of the action taken to address the deficiency items and these forms must be returned in a timely manner to the CxA.
3. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases, the deficiency and resolution will be documented by the CxA.
4. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or compromising acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.
5. Cost of Retesting
    a. The cost for the Contractor to repeat a pre-functional inspection or functional test, if they are responsible for the deficiency, shall be theirs.
    b. The time for the CxA to direct any retesting required because a specific pre-functional inspection of start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the appropriate CTR.
6. The Contractor shall respond in writing to the CxA at least as often as commissioning meetings are scheduled concerning the status of each apparent outstanding

discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

C. Failure Due to Manufacturer Defect or Improper Installation - If 10%, or three, whichever is greater, of identical pieces of equipment (size alone does not constitute a difference) fail to perform to the Contract Documents (either mechanically or substantively) due to manufacturing defect or improper installation, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CxA, PM, A/E or Owner. In such case, the Contractor shall provide the Owner with the following:

1. Within seven (7) days one week of notification from the A/E (via the CxA), the contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CxA or PM within fourteen (14) days two weeks of the original notice.
2. Within fourteen days (14) two weeks of the original notification, the contractor or manufacturer shall provide a signed and dated written explanation of the problem, cause of failures, etc., and all proposed solutions, which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The CxA, CM and PM will determine whether a replacement of all identical units or a repair is acceptable.
4. Two examples of the proposed solution will be installed by the Contractor and the CxA will be allowed to test the installations for up to one week, upon which the CxA or PM will decide whether to accept the solution.
5. Upon acceptance, the contractor and/or manufacturer shall replace or repair all identical items, at their expense, and extend warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval – The CxA documents each satisfactorily demonstrated functional test.

3.6 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals

1. The specific content and format requirements for the standard O&M manuals are detailed in the contract documents. Special requirements for the controls representative and TAB are detailed in the contract documents.
2. Prior to substantial completion, the CxA shall review the O&M manuals, documentation and redline as-builts for systems that were commissioned to verify compliance with the specifications. The CxA will communicate deficiencies in the manuals to the CTRs, PM, CM, A/E or Owner as requested. Upon successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the PM, CM, A/E and Owner. The CxA also reviews each commissioned equipment's warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E contract.

3.7 TRAINING OF OWNER PERSONNEL

A. The CM shall be responsible for training coordination and scheduling and for ultimately ensuring that training is completed. The CM shall inform the CxA when training will be scheduled.

B. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of the Owner personnel for commissioned equipment.

C. The CxA shall interview the facility manager and lead engineer to determine the special needs and areas where training would be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned equipment.

D. In addition to these general requirements, the specific training requirements of Owner's personnel by CTRs, as detailed in the specifications, shall be provided.

E. Each CTR and vendor responsible for training will submit a written training plan to the CxA, for review and approval prior to training. The plan will cover the following elements:

1. Equipment (included in training)
2. Intended audience
3. Location of training
4. Objectives
5. Subjects covered (description, duration of discussion, special methods, etc.)
6. Duration of training on each subject
7. Instructor for each subject and qualifications
8. Methods (classroom lecture, video, site walk thru, actual demonstrations, etc.)

F. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training.

3.8 DEFERRED TESTING

A. Unforeseen Deferred Tests – If any inspection or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of inspections and functional testing may be delayed upon approval of the PM or Owner. These tests will be conducted in the same manner as the seasonal test as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing – During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate CTRs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made.

3.9 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the specifications. The Commissioning Plan lists all the formal written work products, describes briefly their contents, who is responsible to create them, and who receives and approves them. In summary the written products are:

Product	Developed By
1. Final Commissioning Plan	CxA
2. Commissioning Schedules	CxA, CM and CTRs
3. Equipment Documentation Submittals	CTRs
4. Sequence Clarifications	A/E and CTRs as needed
5. Pre-Functional Inspection Forms	CxA
6. Pre-Functional Inspections	CxA
7. Startup and Initial Checkout Plans	CTRs
8. Final TAB Report	TAB CTR
9. Commissioning Progress Record	CxA
10. Deficiency Reports	CxA
11. Functional Test Procedures	CxA
12. O&M Manuals	CTRs
13. Commissioning Record	CxA
14. Overall Training Plans	CM and CTRs
15. Final Commissioning Report	CxA

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SECTION 260501
ELECTRICAL DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

B. Asbestos and PCBs must be abated completely prior to any task unless demolition is required to access the asbestos or PCBs. If asbestos or suspected hazardous materials are discovered and/or disturbed, cease operations and notify Owner and Owner's Representative immediately.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation .

C. Report discrepancies to Architect before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

C. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
2. Make temporary connections to maintain service in areas adjacent to work area.
3. Provide a temporary generator adequate to supply construction power for the duration of the service outage to replace the existing equipment.

D. Existing Fire Alarm System:

1. Contractor shall provide and install temporary heat detectors and connect to existing (Edwards EST3) Fire Alarm System. During the renovation to the building the heat detectors shall remain active until new devices are installed and the system is operational and approved for use.
2. Upon removal of Fire Alarm Devices, they shall be cleaned and stored for reinstallation. Contractor is to provide owner with receipt for exact quantities of the different devices that where removed.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Disconnect and remove abandoned panelboards and distribution equipment.

F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

J. Recycle removed fluorescent lamps.

K. Disconnect and remove existing security devices. Log all equipment removed prior to being turned over to owner.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 260502
REMOVAL OF FLUORESCENT LIGHT BALLASTS/CAPACITORS AND FLUORESCENT LIGHT TUBES

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This specification covers removal of fluorescent light ballasts/capacitors and fluorescent light tubes. Products shall be as follows or as directed by DASNY. Demolition and removal of materials shall be as required to support the work.

1.2 SUBMITTALS

A. Before Start of Work: Submit the following to the Owner's Representative for review (A-1). Do not start work until these submittals are returned with Owner's Representative's approval.
   1. Copy of State or local license for hazardous waste hauler;
   2. Certification of at least one on-site supervisor which has satisfactorily completed the OSHA 40 Hour Health and Safety Course for Handling Hazardous Materials;
   3. Certificates of workers which have successfully completed at least the OSHA 40 Hour Health and Safety Course for Hazardous Materials;
   4. Certificates of workers which have successfully completed the required employee training for universal waste or appropriate type of training to the type of wastes being manages;
   5. Schedule of start and finish times and dates for this work;
   6. Name and address of the universal waste handler or a destination facility where the waste materials is to be treated, deposited or recycled in accordance with all regulatory requirements (include contact person and telephone numbers), if the universal waste meets the definition of hazardous waste, the name and address of the hazardous waste treatment, storage and disposal (TSD) facility;
   7. Material Safety Data Sheets for all materials requiring removal;
   8. If Contractor introduces any chemical into the work environmental, a MSDS for that chemical is required before use;
   9. Contingency Plan for handling emergency spills or leaks;
   10. Provide a copy of the NYS DEC Part 364 Waste Transporter permit for Universal Waste Transporters that transport more than 500 pounds of universal waste in a single shipment since they must be a permitted hazardous waste transporter.
   11. Large Quantity Handlers of universal waste must provide documentation of notification to the EPA and/or the appropriate local government agency in advance of its intentions to transport the waste and receive from the facility or provide an EPA identification number prior to exceeding 5,000 kilograms of waste on-site and
   12. Provide a record of all universal waste shipments received and sent offsite from the project.

1.3 DEFINITIONS

A. Large Quantity Handler (LQH) of Universal Waste shall be a waste handler who accumulates 5,000 kilograms or more of universal waste (batteries, pesticides, thermostats, or lamps, calculated collectively) at any time. This designation as a large quantity handler of universal waste is retained through the end of the calendar year in which 5,000 kilograms (11,000 pounds) or more total of universal waste is accumulated. The LQH shall notify the EPA, acquire or co-ordinate with a facility regarding an EPA identification number, and provide records for each shipment. The LQH shall ensure all employees are thoroughly familiar with proper waste handling and emergency

procedures, relative to their responsibilities during normal facility operations and emergencies.

B. Small Quantity Handler of Universal Waste (SQH) shall be a waste handler who does not accumulate 5,000 kilograms (11,000 pounds) or more of total universal waste (batteries, pesticides, thermostats, or lamps, calculated collectively) at any time.

C. Destination Facility shall be a facility that legitimately and can legally accept universal waste from offsite so that the universal waste can be treated, disposed, or recycled in accordance with the regulatory requirements.

D. Universal Waste Transporter shall be anyone who transports universal waste. In New York, universal waste transporters that transport greater than 500 pounds of universal waste in a single shipment must be a permitted hazardous waste transporter pursuant to Federal and State regulations. Proper notifications with the receiving handler agreeing to receive the shipment is required by the Universal Waste Transporter.

E. Employee training shall ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relative to their responsibilities during normal operations and emergencies and to the type of waste they are handling.

PART 2 PRODUCTS

2.1 MATERIALS

A. Polyethylene Sheet: A single polyethylene film in the largest sheet size possible to minimize seams, 6.0 mil thick, clear, frosted, or black.

B. Duct Tape: Provide duct tape in 3" widths, with an adhesive which is formulated to stick aggressively to sheet polyethylene.

C. Spray Cement: Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.

D. Disposal Bays: Provide 6 mil thick leak-tight polyethylene bags.

E. Labels: As required by the EPA and OSHA for handling, transportation, and disposal of hazardous waste.

F. Drums: Recovery or salvage drums acceptable for disposal of hazardous waste. Prior approval of drums is required. Drums or containers must meet the required OSHA EPA (40 CFR Parts 264265 and 300), and DOT regulations (49 CFR Parts 171-178). Use of damaged drums will not be allowed.

PART 3 EXECUTION

3.1 UNIVERSAL WASTE

A. Once the properly labeled containers holding the universal waste have been filled and sealed, they shall be stored in designated accumulation areas as agreed upon by the Owners Representative and Contractor. They shall not be allowed to store in transportation vehicles, or onsite for more than one year from when the waste has been generated.

B. Documentation when a universal waste in storage was first accumulated shall be provided. This is to be done by dating and labeling the waste with the date of the earliest accumulation that can document the length of time the universal waste has been accumulated.

C. Maintenance of an inventory system on-site that identifies the earliest date that any universal waste in a group of universal waste items or a group of containers of universal waste became a waste was received.

D. Any waste developed from the work that exhibits one or more characteristics of hazardous waste must be handled accordingly and not as a universal waste.

3.2 OFF-SITE SHIPMENT OF UNIVERSAL WASTE

A. Off-Site shipments shall meet the requirements for offsite shipments and is prohibited from sending or taking universal waste to a place other than a designated universal waste handler or a universal waste destination facility.

B. LQH's of universal waste must notify EPA in writing and develop an EPA identification number or co-ordinate with the facility regarding use of their EPA identification number, prior to exceeding 5,000 kilograms of universal waste onsite.

C. SQH;s do not need to notify EPA, receive and EPA identification number or keep records of shipments of universal waste.

D. LQH's must keep a record of all universal waste shipments received or sent offsite, and must retain those records for at least three years from the date of receipt or shipment. Records may include invoices, manifests, logs, bills or lading, or other shipping documents.

3.3 STORAGE OF HAZARDOUS WASTE (IF REQUIRED)

A. Once the properly labeled containers holding the hazardous waste have been filled and sealed, they shall be stored in designated areas as agreed upon by the Owners Representative and Contractor. They shall not be allowed to store the hazardous waste for more than the storage limitations relating to quantities stored and the length of time the material may be stored.

B. Documentation when a hazardous waste in storage was first stored shall be provided. This is to be done by dating and labeling the waste with the date of the earliest accumulation that can document the length of time the hazardous waste has been accumulated.

C. Maintenance of an inventory system on-site that identifies the earliest date that any hazardous waste was placed into proper storage.

3.4 OFF-SITE SHIPMENT OF HAZARDOUS WASTE

A. Off site shipments shall meet the requirements for offsite shipments and is prohibited from sending or taking hazardous waste to a place other than an authorized treatment, storage and disposal (TSD) facility.

B. An EPA identification shall be developed or provided by the facility.

C. A copy of the transporter's Part 364 Permit shall be provided to the Owner's Representative and the facility representative.

D. A copy of all waste manifests and any test results or waste analysis utilized for the off-site transportation and disposal shall be submitted to DASNY.

END OF SECTION

SECTION 260503
COMMON REQUIREMENTS FOR ELECTRICAL WORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Electrical equipment coordination and installation.
   2. Sleeves for raceways and cables.
   3. Sleeve seals.
   4. Grout.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

D. Coordinate sleeve selection and application with selection and application of firestopping.

PART 2 PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Including type and number required for material and size of raceway or cable.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Obtain Certificate of Electrical Inspection from a recognized inspection agency acceptable to the Owner.

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

F. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Size pipe sleeves to provide ¼-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

F. Seal space outside of sleeves with grout for penetrations of concrete and masonry
1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."

H. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceways and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

I. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

J. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping must be installed in accordance with specification section 078400.

END OF SECTION

SECTION 260505
ARC FLASH HAZARD ANALYSIS/SHORT-CIRCUIT/COORDINATION STUDY

PART 1 GENERAL

1.1 SCOPE

A. The contractor shall furnish short-circuit and protective device coordination only if contractor submits devices that are not Cutler-Hammer type. If Cutler-Hammer devices are to be provided by the contractor, the design engineer will verify the accuracy of the existing study based upon the exact devices the contractor plans to provide.

B. The scope of the studies shall include all NFPA 70E required equipment

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract.

1.3 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
   1. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
   2. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
   3. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
   4. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings
   5. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
   6. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations

B. American National Standards Institute (ANSI):
   1. ANSI C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
   2. ANSI C37.13 - Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
   3. ANSI C37.010 - Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
   4. ANSI C 37.41 - Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.

C. The National Fire Protection Association (NFPA)
   1. NFPA 70 -National Electrical Code, latest edition
   2. NFPA 70E - Standard for Electrical Safety in the Workplace

1.4 SUBMITTALS FOR REVIEW/APPROVAL

A. The studies shall be submitted to the EHS Director prior to receiving final approval The formal study will be provided to verify preliminary findings.

1.5 SUBMITTALS

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. A minimum of three (3) bound copies of the complete final report shall be submitted. Electronic PDF copies of the report shall be provided upon request.

B. The report shall include the following sections:
   1. Executive Summary including Introduction, Scope of Work and Results/Recommendations.

2. Short-Circuit Methodology Analysis Results and Recommendations
3. Short-Circuit Device Evaluation Table
4. Protective Device Coordination Methodology Analysis Results and Recommendations
5. Protective Device Settings Table
6. Time-Current Coordination Graphs and Recommendations
7. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
8. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images.
9. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

1.6 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

C. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed in the past year.

D. The engineering firm shall have a minimum of twenty-five (25) years experience in performing power system studies.

PART 2 PRODUCT

2.1 STUDIES

A. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E -Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. This study shall also include short-circuit and protective device coordination studies. All studies to be prepared by Contracted Engineering Services.

2.2 DATA

A. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall gather up required information from walkthroughs and any supporting documentation available on campus from Facilities.

B. Source combination include present motors and generators and any other required equipment as per NEC/NFPA.

C. Load data utilized may include existing and proposed loads obtained from Documents provided by Owner, or Contractor.

D. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT-CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:
   1. Calculation methods and assumptions
   2. Selected base per unit quantities
   3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis
   4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
   5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
   6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

D. Protective Device Evaluation:
   1. Evaluate equipment and protective devices and compare to short circuit ratings
   2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses
   3. Contracted shall notify Owner in writing, of any circuit protective devices improperly rated for the calculated available fault current.

2.4 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title with descriptive device names.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:
   1. Electric utility's overcurrent protective device
   2. Medium voltage equipment overcurrent relays
   3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
   4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
   5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
   6. Medium voltage conductor damage curves
   7. Ground fault protective devices, as applicable

8. Pertinent motor starting characteristics and motor damage points, where applicable
9. Pertinent generator short-circuit decrement curve and generator damage point
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:
1. A One-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram
5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. Contracted shall notify Owner in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.5 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis (Section 2.03) and the protective device time-current coordination analysis (Section 2.04)

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

C. Circuits 240V or less where available bolted short circuit current is less than 10 kA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E Table 130.7(C)(9)(a), including footnote 3.

D. Circuits 240V or less fed by transformers 112.5 kVA or less may be omitted and will be assumed to have a hazard risk category 0 per IEEE 1584.

E. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

F. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations

G. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must

be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

H. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:
   1. Fault contribution from induction motors should not be considered beyond 5 cycles.

I. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

J. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

K. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

L. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

M. Provide the following:
   1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form with locations of devices (building floor room etc) , and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
   2. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.
   3. The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

2.6 ARC FLASH LABELS

A. If the design engineer's arc flash study is utilized, the arc flash labels will be supplied by the engineer for field installation by the contractor.

B. If the contractor is developing the arc flash study, then the contractor shall provide a 4.0 in. x 4.0 in. Brady thermal transfer type label of high adhesion polyester for each work location analyzed.

C. The labels shall be designed according to the following standards:
   1. UL969 - Standard for Marking and Labeling Systems
   2. ANSI Z535.4 - Product Safety Signs and Labels
   3. NFPA 70 (National Electric Code) - Article 110.16

D. The label shall include the following information:
   1. System Voltage
   2. Flash protection boundary
   3. Personal Protective Equipment category
   4. Arc Flash Incident energy value (cal/cm^2)
   5. Limited, restricted, and prohibited Approach Boundaries
   6. Study report number and issue date

E. Labels shall be printed by a thermal transfer type printer, with no field markings.

F. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:
   1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
   2. Wall Mounted Equipment - Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
   3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

G. Label Installation Labels shall be field installed by Contractor on each piece of equipment required by NFPA 70E in such a way to be durable and readily visible .

END OF SECTION

SECTION 260513
MEDIUM-VOLTAGE CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Medium voltage cable.

B. Cable terminations.

1.2 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

A. IEEE 48 - IEEE Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV; Institute of Electrical and Electronic Engineers; 1996 (R2009).

B. NEMA WC 74 - S5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy; National Electrical Manufacturers Association; 2006.

C. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Product Data: Provide for cable, terminations, and accessories.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE AND HANDLING

A. Accept cable and accessories on site in manufacturer's packages and inspect for damage.

B. Cable shall be placed and shipped on reels. Each end of the cable shall be firmly secured to the reel and durably sealed before shipment.

C. Protect entire cable and accessories form weather by covering with opaque plastic or canvas; provide ventilation to prevent condensation.

D. Materials of this section shall be new and installed within a year of manufacture.

1.7 PROJECT CONDITIONS

A. Verify routing and termination locations of cable bank prior to rough-in.

B. Cable routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

C. Cutting of cables in manholes shall be done with power off to all circuits passing through that manhole with conductors properly grounded. Care shall be taken that no other power source is capable of feeding back into these circuits. When all cut cables are properly grounded, power can be restored to the other circuits. All other work to be performed within a manhole can be performed with other circuits energized, provided adequate protection is provided for the energized cables and personnel working in the manhole.

D. Provide protection from live circuits within manholes by the use of insulation blankets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Kerite

B. Okonite

C. Prysmian Cables

2.2 CABLE

A. Cable Ratings:
1. Rated Voltage
a. Minimum Average Insulation Thickness M.I.
1) Configuration
(a) Insulation Rating
b. 15,000
1) 220
(a) Solidly grounded
(1) 133% nominally 15kV

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wire and cable for 600 volts and less.

B. Wiring connectors and connections.

1.2 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Product Data: Provide for each cable assembly type.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 WIRE MANUFACTURERS

A. Cerro Wire Inc: www.cerrowire.com.

B. Industrial Wire & Cable, Inc: www.iewc.com.

C. Southwire Company: www.southwire.com.

2.2 BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

2.3 METAL CLAD CABLE

A. Description: NFPA 70, Type MC.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation Temperature Rating: 60 degrees C.

E. Insulation Material: Thermoplastic.

F. Armor Material: Steel.

G. Armor Design: Interlocked metal tape.

H. Provide a full sized, insulated, copper ground conductor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Route wire and cable as required to meet project conditions.
   1. Wire and cable routing indicated is approximate unless dimensioned.
   2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
   3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.

C. Use wiring methods indicated.

D. Pull all conductors into raceway at same time.

E. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

F. Protect exposed cable from damage.

G. Support cables above accessible ceiling, using spring metal clips,metal cable ties, straps, and nylon cable ties to support cables from structure. Do not rest cable on ceiling panels.

H. Use suitable cable fittings and connectors.

I. Neatly train and lace wiring inside boxes, equipment, and panelboards.

J. Clean conductor surfaces before installing lugs and connectors.

K. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

L. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

M. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

N. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

O. Identify and color code wire and cable under provisions of Section 260553. Identify each conductor with its circuit number or other designation indicated.

P. MC cable shall be used above accesible Ceilings and in soffits. Provide wire in conduit in walls and for home runs.

Q. All home runs shall be wire in conduit.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding components.

B. Provide all components necessary to complete the grounding system(s) consisting of:
   1. Metal frame of the building.
   2. Existing metal underground gas piping system.
   3. Rod electrodes.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 PERFORMANCE REQUIREMENTS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.

B. NFPA 70 - National Electrical Code; National Fire Protection Association.

C. Grounding System Resistance: 15 ohms max.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cooper Power Systems: www.cooperpower.com.

B. Framatome Connectors International: www.fciconnect.com.

2.2 ELECTRODES

A. Rod Electrodes: Copper-clad steel.
   1. Diameter: 3/4 inch.
   2. Length: 8 feet.

2.3 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

B. Exothermic Connections.

C. Wire: Stranded copper.

D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install ground electrodes at locations indicated. .

B. Install in accordance with manufacturer's instructions.

C. Install raceways securely, in a neat and workmanlike manner, as specified in NECA 1.

D. Use flat-head crews, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.

E. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

F. Each feeder and branch circuit will be provided with its own insulated copper ground conductor. Terminate each on suitable lug, bus, or bushing.

G. Grounding system shall have a 15 ohm max.

END OF SECTION

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.2 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Thomas & Betts Corporation: www.tnb.com.

B. Threaded Rod Company: www.threadedrod.com.

2.2 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

E. Secure fasteners according to manufacturer's recommended torque settings.

END OF SECTION

SECTION 260534
CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Liquidtight flexible metal conduit (LFMC).
C. Electrical metallic tubing (EMT).
D. Rigid polyvinyl chloride (PVC) conduit.
E. Conduit fittings.
F. Conduit, fittings and conduit bodies.
G. Flexible metal conduit (FMC)

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.
B. Section 260529 - Hangers and Supports for Electrical Systems.
C. Section 260553 - Identification for Electrical Systems.
D. Section 260537 - Boxes.
E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.
E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).
F. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; National Electrical Manufacturers Association; 2003.
G. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.
H. NFPA 70 - National Electrical Code; National Fire Protection Association; 2005.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.

4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
1. Under Slab on Grade: Use galvanized steel rigid metal conduit.
2. Exterior, Direct-Buried: Use galvanized steel rigid conduit or schedule 80 PVC encased in concrete, except under roads and parking lots must be rigid metal.
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit.
4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.

D. Embedded Within Concrete:
1. Within Concrete Walls Above Ground: Use electrical metallic tubing (EMT).

E. Concealed Within Masonry Walls: Use electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use LFMC, Liquid Tight Flexible Metal Conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.

K. Exposed, Exterior: Use galvanized steel rigid metal conduit.

L. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet.

M. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motor-Driven Equipment.
      c. Hydraulic, Pneumatic.
      d. Electric Solenoid

2.2 CONDUIT REQUIREMENTS

A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

C. Minimum Conduit Size, Unless Otherwise Indicated:
   1. 3/4 inch (21 mm) trade size.

D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedeg.com.
   2. Republic Conduit: www.republic-conduit.com.
   3. Wheatland Tube Company: www.wheatland.com.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com.
      b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
      c. Thomas & Betts Corporation: www.tnb.com.
   2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
   4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc; Model: www.afcweb.com.

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

D. Description: Interlocked steel construction.

E. Fittings: NEMA FB 1.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

C. Description: Interlocked steel construction with PVC jacket.

D. Fittings: NEMA FB 1.

2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. AFC Cable Systems, IncNone - N/A: www.afcweb.com.
2. Electri-Flex CompanyNone - N/A: www.electriflex.com.
3. International Metal HoseNone - N/A: www.metalhose.com.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel.
a. Do not use aluminum or die cast zinc fittings, except LB type fittings.

D. Description: ANSI C80.3; galvanized tubing.

E. Fittings and Conduit Bodies: NEMA FB 1; steel compression type.

2.7 NONMETALLIC CONDUIT

A. Manufacturers:
1. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com.
2. AFC Cable Systems, Inc: www.afcweb.com.
3. Electri-Flex Company: www.electriflex.com.
4. International Metal Hose: www.metalhose.com.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

D. Description: NEMA TC 2; Schedule 80 PVC.

E. Fittings and Conduit Bodies: NEMA TC 3: Schedule 80 PVC.

F. Shall not be used in places of assembly for power systems.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that mounting surfaces are ready to receive conduits.

B. Verify that conditions are satisfactory for installation prior to starting work.

C. Verify routing and termination locations of conduit prior to rough-in.

D. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.

E. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated and routing is not shown, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
   5. Arrange conduit to maintain adequate headroom, clearances, and access.
   6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
   7. Route conduits above water and drain piping where possible.
   8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   9. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
   10. Group parallel conduits in the same area together on a common rack.

F. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

G. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
   3. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

H. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

I. Underground Installation:
1. Provide trenching and backfilling.
2. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.
3. Under Ground Services: Schedule 80 PVC except under roads and parking lots must be rigid metal conduit.
4. If PVC conduit is used below grade, it must be encased in concrete.

J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment.

K. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation.

L. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

M. Provide grounding and bonding in accordance with Section 260526.

N. Identify conduits in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

B. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Install steel conduit as specified in NECA 101.

D. Arrange supports to prevent misalignment during wiring installation.

E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

G. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.

H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

I. Do not attach conduit to ceiling support wires.

J. Arrange conduit to maintain headroom and present neat appearance.

K. Route exposed conduit parallel and perpendicular to walls.

L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

M. Maintain adequate clearance between conduit and piping.

N. Cut conduit square using saw or pipecutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.

Q. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

R. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.

S. Provide suitable pull string in each empty conduit except sleeves and nipples.

T. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

U. Ground and bond conduit under provisions of Section 260526.

V. Identify conduit under provisions of Section 260553.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in section 260555.

END OF SECTION

SECTION 260535
SURFACE RACEWAYS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface metal raceways.

B. Wireways.

1.2 RELATED REQUIREMENTS

A. Section 262726 - Wiring Devices: Receptacles.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square D: www.squared.com.

B. Wiremold Company: www.wiremold.com.

2.2 SURFACE RACEWAYS

A. Surface Metal Raceway: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.
   1. Finish: Gray enamel.
   2. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.

B. Wireway: General purpose type wireway.
   1. Manufacturer's standard knockouts.
   2. Connector: Slip-in.
   3. Fittings: Lay-in type with removable top, bottom, and side; captive screws.
   4. Finish: Rust inhibiting primer coating with gray enamel finish.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install raceways securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.

D. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

END OF SECTION

SECTION 260536
CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal cable tray systems:
   1. Metal ladder cable tray.
   2. Metal wire mesh/basket cable tray.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

1.3 REFERENCES

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA FG 1 - Fiberglass Cable Tray Systems; 1993 (with Rev 1; 1994).

D. NEMA VE 1 - Metal Cable Tray Systems; 2009.

E. NEMA VE 2 - Cable Tray Installation Guidelines; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the arrangement of cable tray with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others. Coordinate the work with other trades to avoid installation of obstructions within cable tray required clearances.
   2. Coordinate arrangement of cable tray with the dimensions and clearance requirements of the actual products to be installed.
   3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week prior to commencing work of this section.

C. Sequencing:
   1. Do not begin installation of cables until installation of associated cable tray run is complete.

1.5 SUBMITTALS

A. Product Data: Provide data for fittings and accessories.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NEMA VE 2, except do not store cable tray outdoors without cover as permitted in NEMA VE 2.

B. Handle products carefully to avoid damage to finish.

PART 2 PRODUCTS

2.1 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

A. Provide new cable tray system consisting of all required components, fittings, supports, accessories, etc. as necessary for a complete system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.

D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under the service conditions at the installed location.

E. Unless otherwise indicated, specified span/load ratings are according to NEMA VE 1 (metal cable tray systems) or NEMA FG 1 (fiberglass cable tray systems) with safety factor of 1.5 and working load only (no additional concentrated static load).

2.2 METAL CABLE TRAY SYSTEMS

A. Comply with NEMA VE 1.

B. Finishes:
   1. Mill-Galvanized Before Fabrication (Pre-Galvanized) Steel: Comply with ASTM A653/A653M, G90 coating.

C. Metal Ladder Cable Tray:
   1. Material: Mill-galvanized before fabrication (pre-galvanized) steel.
   2. Load/Fill Depth: As indicated on drawings.
   3. Span/Load Rating: As indicated on drawings.
   4. Rung Spacing: 9 inches on center for straight lengths.
   5. Inside Width: As indicated on drawings.
   6. Inside Radius of Fittings: 12 inches.

2.3 BASKET TYPE CABLE TRAY

A. Provide a continuous, rigid wleded steel wire mesh cable tray system. Constructed of longitudidal wires, supported by intersecting transverse wires welded at each intersection to form a mesh. Provide 4" deep, 6" wide tray.

B. Provide all splice components, support hardware and appurtenances for a full installation to comply with manufacturers installation recommendations.

C. Cablofil EZTray or accepted equal.

D. Hardware, including splice connectors and support components furnished by manufacturer.

2.4 ACCESSORIES

A. Shieldind divder strips: Provide divider strips to follow contour of cable tray run for shielding to run power and communications cables in the same tray.

B. Grounding lugs for attachment on tray of continuous ground conductor fixting system.

2.5 CABLE FIRESTOPPING PATHWAY DEVICE

A. Where cable trays are required to penetrate fire or smoke walls, provide enclosed fire rated pathway device. The fire rated pathway device shall contain a built-in fire sealing system sufficient to maintain the hourly rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed, or retrofitted without the need to adjust, remove or reinstall firestop materials. Pathway shall be UL classified and FM approved.

B. Specified Technologies, Inc. EZ-Path Series 44 number as required by number of cables. Substitutions are not acceptable.

2.6 QUALITY ASSURANCE

A. Manufacturer qualifications: ISO 9002 certified.

2.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with lables clearly indicating manufactuer and material.

B. Store materials in a dry area, indoors, protected from damage, and in accordance with manufacturer's instructions.

C. Protect materials and finishes during handling and installation to prevent damage.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install cable tray in accordance with NECA 1 (general workmanship), and NEMA VE 2.

C. Install cable tray plumb and level, with sections aligned and with horizontal runs at the proper elevation.

D. Metal Wire Mesh/Basket Cable Tray: Field fabricate fittings in accordance with manufacturer's instructions, using only manufacturer-approved connectors classified for bonding.

E. Cable Tray Support:
   1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA VE 2 and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment components in accordance with Section 260529, where not furnished by cable tray manufacturer.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

F. Conduit Termination:
   1. Use listed cable tray conduit clamps (evaluated for bonding connection) to terminate conduits at cable tray.
   2. Provide insulating bushing at conduit termination to protect cables.
   3. Provide independent support for conduit.

G. Cable Installation:
   1. Comply with cable installation requirements of NEMA VE 2.
   2. Use appropriate cable pulling tools, applied to prevent excessive force on cable tray system and maintain minimum cable bending radius.
   3. Use cable clamps or cable ties to fasten conductors/cables to vertical and horizontal runs of cable tray.

a. Distance Between Fastening Points for Vertical Runs: 18 inches.
b. Distance Between Fastening Points for Horizontal Runs: As required to maintain spacing and confine conductor/cable within the cable fill area.

H. Support trays in accordance with Section 260529. Provide supports at each connection point, at the end of each run, and at other points to maintain maximum deflection between supports of L/240.

I. Use expansion connectors where required.

J. Ground and bond cable tray under provisions of Section 260526.
1. Provide continuity between tray components.
2. Provide 8 AWG minimum bare copper equipment grounding conductor through entire length of tray; bond to each component.

K. Telecommunications cable only, shall be installed in the cable tray.

3.2 FIELD QUALITY CONTROL

A. Inspect cable tray system for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective cable tray system components.

END OF SECTION

SECTION 260537
BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.2 RELATED REQUIREMENTS

A. Section 262726 - Wiring Devices: Wall plates in finished areas.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

C. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Appleton Electric: www.appletonelec.com.

B. Arc-Co./Division of Arcade Technology: www.arc-co.com.

C. Unity Manufacturing: www.unitymfg.com.

2.2 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 262726.

2.3 FLOOR BOXES

A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.

B. Material: Cast metal.

C. Shape: Rectangular.

2.4 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

C. Set wall mounted boxes at elevations to accommodate mounting heights indicated. Refer to drawing A 101 for typical bedroom elevations.

D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
   1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

E. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.

F. Maintain headroom and present neat mechanical appearance.

G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

H. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

I. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

J. Use flush mounting outlet box in finished areas.

K. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 12 inches separation in acoustic rated walls.

L. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

M. Do not fasten boxes to ceiling support wires.

N. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

O. Use gang box where more than one device is mounted together. Do not use sectional box.

P. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Q. Do not mount boxes back to back.

3.2 ADJUSTING

A. Adjust floor boxes flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

3.3 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

END OF SECTION

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Luminaires:
   1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.2 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Locations:
   1. Each electrical distribution and control equipment enclosure.
   2. Communication cabinets.

C. Letter Size:
   1. Use 1/8 inch letters for identifying individual equipment and loads.
   2. Use 1/4 inch letters for identifying grouped equipment and loads.

D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations..

E. Provide each panelboard with typed written directory indicating room, equipment and/or funtion served by each circuit breaker.

F. Provide labels for each switch, dimmer and receptacle indicating circuit number and panel name.

2.3 WIRE MARKERS

A. Description: Vinyl cloth type self-adhesive wire markers.

B. Description: Cloth or tape type wire markers.

C. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

END OF SECTION

SECTION 260554
TESTING

PART 1

1.1 SYSTEM TESTS

A. Prove entire electrical system free of unintentional grounds or short circuits.
   1. Make any normal insulation resistance tests or load tests required by Engineer or Power Co.
   2. Test wiring and operation of all systems provided for operation in accordance with the drawings and specifications. Perform all tests recommended by equipment manufacturer to assure systems are operating properly.

1.2 OPERATING TEST

A. Upon completion of the installation and before occupancy conduct an operating test as follows:
   1. Energize all possible lighting and equipment loads for a period of not less than six hours.
   2. Check all circuit breakers and fuses for excessive heating and/or faulty tripping.
   3. Measure phase currents on all feeders and tabulate readings.
   4. Measure voltage at each panelboard, phase-to-phase and phase-to-neutral and tabulate readings.
   5. Reconnect branch circuits on any feeder with over 5 percent variation between high and low phase current measurements.
   6. Reconnect taps at any transformer as required to correct for high or low voltage readings.
   7. Present three copies of voltage and current measurements to Engineer.
   8. Provide a NFPA 110 7.13 Generator Installation Acceptance Test on the new Emergency Generator.

1.3 PHASE SEQUENCE CHECK

A. Prior to disconnection of electrical service and/or any feeder to be replaced, measure existing phase sequence.

B. Electric service and/or feeders shall be reconnected as required to produce same phase sequence as originally measured.

1.4 ELECTRICAL INSPECTION

A. Have entire electrical installation inspected by a qualified testing agency and present certificate of inspection to the Owner's representative at the conclusion of the project.

END OF SECTION

SECTION 260555
SLEEVES AND FIRESTOPPING

PART 1 - GENERAL

1.1 PENETRATION SEALS

A. Seal all penetrations required for contractor installations at walls, floor, chases and shafts as noted herein. Refer to architectural drawings for locations of fire and smoke rated walls, floors, chases and shafts. All penetration seals to have ratings to match rating of structural component being penetrated.

1.2 PENETRATIONS OF NON-RATED BARRIERS:

A. All penetrations of walls, floors, ceilings, chases, shafts and enclosures to be sealed, including penetrations occurring above ceilings or in crawl spaces. All penetration seals shall be smoke tight unless noted otherwise. All piping insulation shall be continuous through the opening.

B. All penetrations shall be core drilled in concrete or concrete masonry floors or walls, or hole saw cut through gypsum board walls or partitions. Where core drilling or hole saw drilling is not possible, provide matching infill material applied and formed to limit annular spaces around penetrations to no more than 3/4" on all sides of piping, 2" and larger, ½" on piping smaller than 2". Annular space dimensions refer to distance between outside wall of pipe/insulation jacket and near edge of opening. Pipe need not be centered in opening, but must be securely supported on both sides to prevent weight of pipe and/or insulation from bearing on material to be penetrated. Provide maximum ¼" bead of caulk between opening and pipe/insulation surface. Where space is greater than ¼" provide backer rod or mineral wool insulation to establish seal in accordance with manufacturer's recommendations.

C. Exposed wall and ceiling piping penetrations to be provided with chrome plated brass escutcheons on all exposed faces. Escutcheons for pipe sizes 2" and under to be chrome plated brass with set screw, pipe sizes over 2" to be split ring type secured to wall.

D. New foundation walls, basement walls, crawl space walls or similar below grade barriers shall be provided with steel sleeves with minimum 2" welded waterstop collars, fully cemented into new construction. Sleeves to be sized two nominal pipe sizes larger than the pipe. Annular space between piping and sleeve to be provided with expanding mechanical seals. Penetrations through existing below grade walls to be core drilled, with annular space between drilled opening and pipe sealed with expanding mechanical seals. Mechanical seals to be Thunderline "Link-Seals" or accepted equal.

1.3 PENETRATIONS OF FIRE AND/OR SMOKE BARRIERS:

A. All penetrations of fire rated construction shall be core drilled in concrete or concrete masonry floors or walls, or hole saw cut through gypsum board walls or partitions. Where core drilling is not possible, provide matching infill material applied and formed to limit annular spaces around penetrations to limits required by specific UL system. Annular space dimensions refer to distance between outside wall of pipe and near edge of opening. Pipe need not be centered in opening, but must be securely supported on both sides to prevent weight of pipe and/or insulation from bearing on material to be penetrated.

B. At all penetrations of fire and/or smoke rated walls, barriers, partitions, draft stops, shafts, chases and floors, provide fire rated penetration seal as manufactured by STI

inc. Materials to be SpecSeal Firestop Products, or accepted equal, utilizing the appropriate UL system for the application encountered.

C. For additional information on products and execution, refer to Specification Section 07 8400, Firestopping.

END OF SECTION

SECTION 260800
COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Abbreviations: The following are common abbreviations used in the Specifications.

A/E -	Architects and Design Engineers	EC -	Electrical Representative
CxA -	Commissioning Authority	FT -	Functional Performance Test
CC -	Controls Representative	GC -	General Contractor
CTR -	Installers	MC -	Mechanical Representative
Cx -	Commissioning	PFI -	Pre-Functional Inspection
Cx Plan -	Commissioning Plan Document	PM -	Project Manager (of the owner)
PC-	Plumbing Representative	TAB -	Test and Balance Installer

1.2 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. The Owner and the CxA reserves the right to amend this list at anytime during the construction and acceptance process.

Electrical

1. Lighting and Lighting Controls.
2. Electrical components associated with HVAC and Plumbing equipment including VSDs and motor controllers.

1.3 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. General specifications for commissioning responsibilities and reporting requirements are provided in the following sections:

Section 019113 – General Commissioning Requirements
Section 240100 – Commissioning Requirements

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FUNCTIONAL TESTING SUPPORT REQUIREMENTS

A. General Requirements
   1. This section provides brief descriptions of the testing and support the installer(s) will be required to provide to perform the functional testing of the equipment for the project.
   2. The Cx Authority will further define the tests and procedures in the Testing and Acceptance Modules as well as the individuals required to support the testing.

B. Lighting Controls
   1. All occupancy sensors will be tested for sensitivity and duration of "on period" after area has been vacated.
   2. All switches will be tested for operation, including the operation of multiple 3-way switches.
   3. The installer is expected to test and verify the operation of every occupancy sensor and light switch. The CxA will sample approximately 25% of this system.

C. Electrical components associated with HVAC and Plumbing equipment including VSDs and motor controllers.
   1. All electrical service that provide power to the components that are listed in the other trades to be commissioned, will be inspected. Testing of Variable Speed Drives will be performed during the testing of the fans and pumps themselves.

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SECTION 260920
OCCUPANCY SENSORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy Sensors.

1.2 RELATED REQUIREMENTS

A. Section 26 0537 - Boxes: Switch outlets and installation of switch devices.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data showing dimensions and ratings for components.

C. Shop Drawings: Indicate wiring diagrams of system, showing interface with branch circuit wiring.

D. Project Record Documents: Record actual locations of components and record circuiting and switching arrangements.

E. Maintenance Data: Include replacement parts numbers.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Provide products listed and classified by Underwriters Laboratories Inc.as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Watt Stopper: www.wattstopper.com.

B. Leviton: www.leviton.com.

C. Hubbell

D. Substitutions: With written approval 10-days prior to Bid Date.

E. Products are specified around Leviton

2.2 OCCUPANCY SENSORS

A. Ceiling Mounted - Leviton #OSC20-MOW: Multi Technology, PIR (75 Pct)/Ultrasonic (50 Pct), 40kHZ, 360-degree pattern, Self-Adjusting, Photocell (3,000 Lux) shall be capable of being disabled, Coverage: 2,000 sq.ft., Commercial grade, 24VDC.

1. High-Impact, Injection Molded Plastic. Finish - white.
2. 5-Year Limited Warranty.
3. Provide with Power Pack.

B. Ceiling Mounted - Leviton #OSC20-MOW/OPB15: Multi Technology, PIR (75 Pct)/Ultrasonic (50 Pct), 40kHZ, 360-degree pattern, Self-Adjusting, Photocell (3,000 Lux) shall be capable of being disabled, Coverage: 2,000 sq.ft., Commercial grade, 24VDC. Provide with power base.
   1. High-Impact, Injection Molded Plastic. Finish - white.
   2. 5-Year Limited Warranty.
   3. Provide power base: Leviton #OPB15.

C. Dual Relay, Wall Mounted Occupancy Sensor - Leviton #ODSOD-ID: Passive Infrared (PIR), Controls two (2) separate lighting loads, Dual manual override, Self-Adjusting delay - Off Time Feature. Walk-Through feature, 180-degree Field of View, Coverage: 2,100 sq.ft., Self-Adjusting Ambient Light Override, Specification grade.
   1. High-Impact, Injection Molded Plastic. Finish - white.
   2. 5-Year Limited Warranty.
   3. Multi Volt.

D. Wall Switch Occupancy Sensor - Leviton #ODS15-ID: Passive Infrared (PIR), Self-Adjusting Ambient Light Override, Self-Adjusting Delayed - Off Time, Manual - Onn/Automatic - Off, Field of View: Horizontal - 180-degrees; Arc Field - 32-degrees, Coverage: 2,100 sq.ft.
   1. High-Impact, Injection Molded Plastic. Finish - white.
   2. 5-Year Limited Warranty.
   3. Multi Volt.

E. High Bay Occupancy Sensor - Leviton #OSFHU: Passive Infrared (PIR) Technology, Designed for 20 to 40 ft. mountings. Fixture mounted.
   1. High-Impact, Injection Molded Plastic. Finish - white.
   2. 5-Year Limited Warranty.
   3. Multi Volt.
   4. Provide offset adapter, if required by fixture depth - Leviton #OSFOA-OOW.

F. Ceiling corridor mounted Occupancy Sensor - Hubbell PIR1000H: Passive Infrared (PIR), fully adjustable sensitivity, adjustable time delay, walk test indicator, 16' x 80' coverage.
   1. High-Impact, Injection Molded Plastic. Finish - white.
   2. 5-Year Limited Warranty.

2.3 POWER PACKS

A. Power Pack - Leviton #OSP: Self contained transformer and relay, 24VDC/5mA control input, 24VDC/150mA output, 20-Amp line voltage relay, 60HZ.
   1. 5-Year Warranty.
   2. UL2043 Plenum - Rating.
   3. Multi Volt.

B. Additional Relay Module - Leviton #OSA: Self contained relay, 20-Amp line voltage relay, 24VDC/5mA control input.
   1. 5-Year Warranty.
   2. UL2043 Plenum - Rating.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all wiring in conduit in accordance with Section 26 0534.

3.2 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of each system.

END OF SECTION

SECTION 261200
MEDIUM-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dry-type pad-mounted distribution transformers.

1.2 REFERENCE STANDARDS

A. IEEE C57.12.28 - IEEE Standard for Pad-Mounted Equipment -- Enclosure Integrity; 2011.

B. IEEE C57.12.55 - Conformance Standard for Dry-Type Transformers Used in Unit Installations, Including Unit Substations; 1987 (R 1998).

C. IEEE C57.12.01 - IEEE Standard General Requirements for Dry-Type Distribution and Power Transformers Including Those With Resin-Encapsulated Windings; Institute of Electrical and Electronic Engineers; 2005.

D. IEEE C57.12.91 - IEEE Test Code for Dry-Type Distribution and Power Transformers; Institute of Electrical and Electronic Engineers; 2011.

E. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers; Institute of Electrical and Electronic Engineers; 1982 (R2006).

F. NEMA 260 - Safety Labels for Padmounted Switchgear and Transformers Sited in Public Areas; National Electrical Manufacturers Association; 1996 (2004).

G. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

H. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.3 SUBMITTALS

A. Shop Drawings: Indicate electrical characteristics and connection requirements, outline dimensions, connection and support points, weight, specified ratings and materials.

B. Product Data: Provide electrical characteristics and connection requirements, standard model design tests, and options.

C. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.

D. Manufacturer's Installation Instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Field Reports: Indicate activities on site, final adjustments and overcurrent protective device coordination curves, adverse findings, and recommendations.

G. Project Record Documents: Include copy of manufacturer's certified drawings.

H. Maintenance Data: Include maintenance instructions for cleaning methods; cleaning materials recommended; procedures for sampling and maintaining fluid.

I. Submit a plan on how they are going to get the transformer inside the building electric room.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Testing Agency Qualifications: Company member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect dry-type transformers from moisture by using appropriate heaters as instructed by the manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation; Cutler-Hammer Products: www.eaton.com. REF #PCC-16-0001-000-002.

B. Schneider Electric; Square D Products: www.schneider-electric.us.

C. Cooper Power Systems, a division of Cooper Industries: www.cooperindustries.com.

2.2 DRY-TYPE TRANSFORMERS

A. Dry-Type Transformers: IEEE C57.12.55; three phase, pad-mounted, transformer unit with resin-encapsulated windings.

B. The electrical insulation system shall utilize Class H material in a fully rated 220 degrees C system. Transformer design temperature shall be based on a 30 degrees C average ambient over a 24-hour period with a maximum of 40 degrees C. Solid insulation in the transformer shall consist of inorganic materials such as porcelain, glass fiber, electrical grade glass polyester, electrical grade epoxy, or Nomex. All insulating material must be rated for continuous 220 degree C duty.

C. The transformer shall be designed for a temperature rise of 150 degrees C.

D. Transformer shall be designed to meet the sound level standards for dry-type transformers as defined in NEMA TR1.

E. shall be UL labeled.

2.3 SERVICE CONDITIONS

A. Meet requirements for usual service conditions described in IEEE C57.12.00 and for the specified unusual service conditions.

2.4 RATINGS

A. Capacity: 300 kVA.

B. Primary Voltage: 15 kV delta connected.

C. Taps: Standard primary taps.

D. Secondary Voltage: 208/120 volts, wye connected.

E. Impedance: 5.75 percent maximum.

F. Basic Impulse Level: 60 kV.

G. CLASS: AA

H. TYPE: VPI

2.5 ACCESSORIES

A. Accessories: IEEE C57.12.00 standard accessories and IEEE C57.12.01 standard accessories.

B. Primary Terminations: Porcelain insulator with clamp-type connector.

C. Provide enclosures for primary and secondary cable terminations. All cable terminations shall be accessible from the front of the unit.

2.6 FABRICATION

A. Conform to the requirements of IEEE C57.12.28.

2.7 FACTORY FINISHING

A. Clean surfaces before applying paint.

B. Apply corrosion-resisting primer to all surfaces.

C. Apply finish coat of baked enamel paint to 2 mils thick.

D. Finish Color: Manufacturer's standard dark gray finish.

2.8 SOURCE QUALITY CONTROL

A. Provide factory tests to IEEE C57.12.91 and IEEE C57.12.01.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that support pads provided under Section 033000 are ready to receive products.

B. Verify that field measurements are as indicated on shop drawings.

3.2 INSTALLATION

A. Install in accordance with IEEE C57.94.

B. Install plumb and level.

C. Install safety labels to NEMA 260.

D. Provide a manufacture technician to disassemble the transformer and reassemble when it is moved inside the building.

E. Perform on site testing once reassembled.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS, except Section 4.

B. Perform inspections and tests listed in NETA STD ATS, Section 7.2.

3.4 ADJUSTING

A. Adjust primary taps so that secondary voltage is above and within 2 percent of rated voltage.

END OF SECTION

SECTION 262413
SWITCHBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Switchboards.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

1.3 REFERENCE STANDARDS - CURRENT ADOPTED EDITION OF THE FOLLOWING STANDARDS.

A. NECA 400 - Standard for Installing and Maintaining Switchboards (ANSI); National Electrical Contractors Association.

B. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association.

C. NEMA PB 2 - Deadfront Distribution Switchboards; National Electrical Manufacturers Association.

D. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; National Electrical Manufacturers Association.

E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Product Data: Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of all equipment and components.

B. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; and switchboard instrument details.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 SWITCHBOARDS

A. Description: NEMA PB 2 switchboard with electrical ratings and configurations as indicated and specified.

B. Ratings:
   1. Voltage: 120/208 volts.
   2. Configuration: 1000A three phase, four wire, grounded, 22,000 AIC.

C. Main Section Devices: Panel mounted.
   1. Provide separate Fire pump tap connection section as per NEC 695.3 (A) (1).
   2. Provide separate fire pump breaker section.

D. Distribution Section Devices: Panel mounted.
   1. Circuit Breakers 250 Amp and above shall have adjustable trip settings.
      a. 1000A Main Breaker
         1) LTPU: 1
         2) LTD: 3
         3) STPU: 2.5
         4) STD: .5
         5) I2t: In
         6) INST: 6
      b. 1500A Breaker
         1) LTPU: 1
         2) LTD: 2
         3) STPU: 1.5
         4) STD: .5
         5) I2t: In
         6) INST: 6
      c. 300A Fire Pump Feeder Breaker
         1) LTPU: 1
         2) LTD: 1
         3) STPU: 8
         4) STD: .4
         5) I2t: In
         6) INST: 6
      d. 600A Generator Main Breaker
         1) LTPU: 1
         2) LTD: 7
         3) STPU: 8
         4) STD: .5
         5) I2t: In
         6) INST: 5

E. Bus Material: Copper, standard size.

F. Bus Connections: Bolted, accessible from front for maintenance.

G. Ground Bus: Extend length of switchboard.

H. Solid-State Molded Case Circuit Breakers: With electronic sensing, timing and tripping circuits for adjustable current settings; UL listed.

I. Enclosure: Type 1 - General Purpose.
   1. Align sections at front and rear.

2. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.
3. Maximum width shall not exceed 9'-2", due to existing conditions.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that field measurements are as indicated on shop drawings.

3.2 INSTALLATION

A. Install switchboard in locations shown on drawings, according to NEMA PB 2.1.

B. Install in a neat and workmanlike manner, as specified in NECA 400.

C. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

END OF SECTION

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Lighting and appliance panelboards.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260553 - Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA PB 1 - Panelboards; 2011.

C. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 MAINTENANCE MATERIALS

A. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

B. GE Industrial: www.geindustrial.com.

C. Square D: www.squared.com.

2.2 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

C. Minimum Integrated Short Circuit Rating:
   1. 208/120 Volt Panelboards: 22,000 amperes rms symmetrical.

D. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
   1. Type SWD for lighting circuits.
   2. Type HACR for air conditioning equipment circuits.
   3. Class A ground fault interrupter circuit breakers where scheduled.
   4. Type AFCI for RD apartment bedroom/living room, kitchen circuits as per NEC 210.12 (A)

5. Type AFCI for all dormitory unit bedrooms, living rooms, hallways, closets, suites as per NEC 210.12 (C).

E. Enclosure: NEMA PB 1, Type 1.

F. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.

G. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

C. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
   1. Minimum spare conduits: 6 empty 1 inch.

G. Ground and bond panelboard enclosure according to Section 260526.

END OF SECTION

SECTION 262717
EQUIPMENT WIRING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.4 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Wiring Devices: As specified in Section 262726.

C. Flexible Conduit: As specified in Section 260534.

D. Wire and Cable: As specified in Section 260519.

E. Boxes: As specified in Section 260537.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Device plates and decorative box covers.

1.2 RELATED REQUIREMENTS

A. Section 260537 - Boxes.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 EXTRA MATERIALS

A. Furnish 3 of each style, size, and finish wall plate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cooper Wiring Devices: www.cooperwiringdevices.com.

B. GE Industrial: www.geindustrial.com.

C. Leviton Manufacturing, Inc: www.leviton.com.

2.2 WALL SWITCHES

A. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
   1. Body and Handle: white plastic with toggle handle.
   2. Ratings:
      a. Voltage: 120 volts, AC.
      b. Current: 20 amperes.

B. Switch Types: Single pole, 3-way, and 4-way.

C. Momentary Contact Switch: Industrial Grade, 20-Amp, Back/Side Wired, Three-Position, Center "OFF".

D. Key Switches: Industrial Grade, 20-Amp, Back/Side Wired.

E. Provide label for each switch indicating circuit number and panel name.

2.3 WALL DIMMERS

A. Wall Dimmers: Coordinate compatable dimmers with LED fixtures comply with NEMA WD 6 and WD 1.
   1. Body and Handle: white plastic with linear slide.
   2. Voltage: 120 volts.
   3. Power Rating: Match load shown on drawings; 1,000 watts minimum.
   4. Provide label for each dimmer indicating circuit number and panel name.

2.4 RECEPTACLES

A. Receptacles: Heavy duty, tamper resistant, complying with NEMA WD 6 and WD 1.
   1. Device Body: white plastic.

B. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

C. Dryer Receptacle-125V/250V 30A NEMA 14-30R.

D. Range Receptacle125V/250V 50A NEMA 14-50R.

E. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

F. Provide label for each receptacle indicating circuit number and panel name.

2.5 WALL PLATES

A. Mid-sized unbreakable Cover Plates: white, nylon.

B. Weatherproof Cover Plates: Provide weatherproof "While-in-use" polycarbonite covers.

C. Provide Red coverplates for emergency receptacles.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that outlet boxes are installed at proper height.

B. Verify that wall openings are neatly cut and will be completely covered by wall plates.

C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean interior of boxes to remove dust, debris, and other materials.

3.3 INSTALLATION

A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

E. Install receptacles with grounding pole on top.

F. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

G. Install standard plates on switch, receptacle, and blank outlets in finished areas.

H. Connect wiring devices by wrapping conductor around screw terminal.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 260537 to obtain mounting heights specified.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 inches above finished floor, unless noted oterwise.

D. Install convenience receptacle 6 inches above counter.

E. Install dimmer 48 inches above finished floor.

F. Install telephone jack 18 inches above finished floor, unless noted otherwise.

G. Install telephone jack for side-reach wall telephone to position top of telephone at 54 inches above finished floor.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.7 PROGRAMMING

A. Program devices as required for proper functioning of device.

END OF SECTION

SECTION 262813
FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

1.2 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cooper Bussmann: www.bussmann.com.

B. Ferraz Shawmut, Inc: www.ferrazshawmut.com.

C. Littelfuse: www.littelfuse.com.

2.2 FUSES - GENERAL

A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 262818
ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fusible switches.

B. Nonfusible switches.

1.2 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002 (R2007).

B. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 SUBMITTALS

A. Product Data: Provide switch ratings and enclosure dimensions.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

B. GE Industrial: www.geindustrial.com.

C. Square D: www.squared.com.

2.2 COMPONENTS

A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   2. Handle lockable in OFF position.
   3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   2. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fuses in fusible disconnect switches.

C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

END OF SECTION

SECTION 262913
ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manual motor controllers.

B. Magnetic motor controllers.

C. Combination magnetic motor controllers and disconnects.

1.2 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260553 - Identification for Electrical Systems: Engraved nameplates.

1.3 SUBMITTALS

A. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

B. GE Industrial: www.geindustrial.com.

C. Square D: www.squared.com.

2.2 MANUAL CONTROLLERS

A. Manual Motor Controllers: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller with overload element, red pilot light, NO auxiliary contact, and push button operator.

B. Fractional Horsepower Manual Controllers: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator.

C. Motor Starting Switches: NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, with red pilot light and toggle operator.

2.3 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Overload Relays: NEMA ICS 2; bimetal.

C. Enclosures: NEMA ICS 6, Type 1.

2.4 ACCESSORIES

A. Auxiliary Contacts: NEMA ICS 2, 2 normally open contacts in addition to seal-in contact.

B. Cover Mounted Pilot Devices: NEMA ICS 5, standard duty oiltight type. Provide H-O-A swtich for each motor starter.

C. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.

D. Indicating Lights: Transformer, incandescent type.

E. Selector Switches: Rotary type.

F. Control Power Transformers: 120 volt secondary, as scheduled. Provide fused primary, secondary, and bond unfused leg of secondary to enclosure.

2.5 DISCONNECTS

A. Combination Controllers: Combine motor controllers with disconnects in common enclosure. Obtain IEC Class 2 coordinated component protection.

B. Nonfusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

B. Provide supports in accordance with Section 260529.

C. Select and install overload heater elements in motor controllers to match installed motor characteristics.

D. Provide engraved plastic nameplates; refer to Section 260553 for product requirements and location.

E. Neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

3.2 FIELD QUALITY CONTROL

A. Provide field inspection, start-up and testing services from a factory authorized representative.

END OF SECTION

SECTION 263213
ENGINE GENERATORS

PART 1 GENERAL

1.1 REFERENCES AND STANDARDS

A. The generator set covered by these specifications shall be designed, tested, rated, assembled and installed in strict accordance with all applicable standards current adopted edition of the following standards below:
   1. EN61000-6
   2. EN55011
   3. FCC Part 15 Subpart B
   4. ISO8528
   5. IEC61000
   6. UL508
   7. UL2200 (1998 Edition, as referenced by the Building Code of NYS, Section 2702.1.1).
   8. UL142
   9. Designed to allow for installed compliance to NFPA 70, NFPA99
   10. NFPA 37, 2006 Edition
   11. NFPA 110, 2013 Edition
   12. NFPA 111
   13. Fuel Gas Code of NYS, 2015 Edition
   14. NFPA 54, 2006 Edition (as referenced in NFPA 37)
   15. NYS Building Code
   16. National Electrical Code (per 2702.1 of the Building Code)

1.2 WORK INCLUDED

A. Installation
   1. The work includes supplying and installing a complete integrated generator system. The system consists of a Natural Gas generator set with related component accessories and automatic transfer switches specified under a separate section.

B. Fuel System
   1. Natural Gas.

C. System Test
   1. A complete system load test shall be performed after all equipment is installed. Guidelines in the Start-up Section.

D. Requirements, Codes and Regulations
   1. The equipment supplied and installed shall meet the requirements of the NEC and all applicable local codes and regulations. All equipment shall be of new and current production by a MANUFACTURER who has 25 years of experience building this type of equipment. Manufacturer shall be ISO9001 certified.

1.3 SUBSTITUTION

A. Proposed deviations from the specifications shall be treated as follows:
   1. Substitution Time Requirement
      a. Requests for substitutions shall be made a minimum of five (5) days prior to bid date. Manufacturers catalog data shall accompany each request and authorized acceptance shall be addenda only.
   2. Substitution Responsibility
      a. The power system has been designed to the specified manufacturer's electrical and physical characteristics. The equipment sizing, spacing, amounts, electrical wiring, ventilation equipment, fuel, and exhaust

components have all been sized and designed around GENERAC supplied equipment. Should any substitutions be made, the CONTRACTOR shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

1.4 SUBMITTALS

A. Engine-generator submittals shall include the following information:
   1. Factory published specification sheet.
   2. Manufacturer's catalog cut sheets of all auxiliary components such as battery charger, control panel, enclosure, etc.
   3. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories.
   4. Weights of all equipment.
   5. Concrete pad recommendation, layout and stub-up locations of electrical and fuel systems.
   6. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, control panel, and remote alarm indications.
   7. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, fuel consumption, etc.
   8. Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
   9. Generator resistances, reactances and time constants.
   10. Generator locked rotor motor starting curves.
   11. Manufacturer's documentation showing maximum expected transient voltage and frequency dips, and recovery time during operation of the generator set at the specified site conditions with the specified loads.
   12. Manufacturer's and dealer's written warranty.
   13. Provide detailed submittals for the generator and associated auxiliaries. Submittals shall include but not limited to; UL 2200 listing documentation, gas train schematic diagram, factory test results, equipment ratings/performance, installation instructions, and operations and maintenance manuals.
   14. All submittals must be reviewed and approved prior to shipment of the generator.
   15. Factory must test generator set. The test must be performed at the rated power factor to allow the field acceptance test to be performed with a unity power factorload bank per NFPA 110, Section 7.13.6.1.

1.5 SYSTEM RESPONSIBILITY

A. Generator Set Distributor
   1. The completed engine generator set shall be supplied by the Manufacturer's authorized distributor only.

B. Requirements, Codes and Regulations
   1. The equipment supplied and installed shall meet the requirements of NEC and all-applicable local codes and regulations. All equipment shall be new, of current production. There shall be one source responsibility for warranty; parts and service through a local representative with factory trained service personnel.

C. Automatic Transfer Switch
   1. The automatic transfer switch(es) specified in another section shall be supplied by the generator set manufacturer in order to establish and maintain a single source of system responsibility and coordination.

1.6 WARRANTY

A. Two Year Standby (ISO 8528-1: ESP) Generator Set Warranty
   1. The manufacturer's standard warranty shall in no event be for a period of less than two (2) years from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Running hours shall be limited to 500 hours annually for the system warranty by both the manufacturer and servicing distributor. Submittals received without written warranties as specified will be rejected in their entirety.

B. Call back response time shall be 24 hours 7 days a week.

C. On-site response time shall be 24 hours 7 days a week.

1.7 PARTS AND SERVICE QUALIFICATIONS

A. Service Facility
   1. The engine-generator supplier shall maintain 24-hour parts and service capability within 100 miles of the project site. The distributor shall stock parts as needed to support the generator set package for this specific project. The supplier must carry sufficient inventory to cover no less than 80% parts service within 24hrs and 95% within 48 hours.

B. Service Personnel
   1. The dealer shall maintain qualified factory trained service personnel.

PART 2 PRODUCT SPECIFICATIONS

2.1 GENERAL REQUIREMENTS

A. Genset Requirements
   1. The generator set shall be Standby Duty rated at 150 kW, 1800 RPM, 0.8 power factor, 208 V, 3-Phase, 60 hertz, including radiator fan and all parasitic loads. Provide an upsized (250KW) alternator. Generator set shall be sized to operate at the specified load at a maximum ambient of 105F and altitude of 800.0 feet.

B. Material and Parts
   1. All materials and parts comprising the unit shall be new and unused.

C. Genset must be factory tested.
   1. Provide detailed manufacturer testing specifications/protocols. The tests must be preformed at the rated power factor to allow the field acceptance test to be preformed with a unity power factor load bank per NFPA 110, Section 7.13.6.1.

D. Engine
   1. The engine shall be natural gas fueled, four (4) cycle, water-cooled, while operating with nominal speed not exceeding 1800 RPM. The engine will utilize in-cylinder combustion technology, as required, to meet applicable EPA non-road mobile regulations and/or the EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 - D2 Emissions Cycle at specified ekW / bHP rating. Utilization of the "Transition Program for Equipment Manufacturers" (also known as "Flex Credits") to achieve EPA certification is not acceptable. The in-cylinder engine technology must not permit unfiltered exhaust gas to be introduced into the combustion cylinder. Emissions requirements / certifications of this package: EPA T2

a. Engine Governing
    1) The engine governor shall be an electronic Engine Control Module (ECM) with 24-volt DC Electric Actuator. The ECM shall be enclosed in an environmentally sealed, die-cast aluminum housing which isolates and protects electronic components from moisture and dirt contamination. Speed droop shall be adjustable from 0 (isochronous) to 10%, from no load to full rated load. Steady state frequency regulation shall be +/- 6 RPM. Speed shall be sensed by a magnetic pickup off the engine flywheel ring gear. A provision for remote speed adjustment shall be included. The ECM shall adjust fuel delivery according to exhaust smoke, altitude and cold mode limits. In the event of a DC power loss, the forward acting actuator will move to the minimum fuel position.

2.2 GENERATOR

A. Manufacturer:
    1. Generac. - SG150
    2. Cummins Power Generation Inc-
    3. Kohler Co

B. Generator Specifications
    1. The synchronous three phase generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling. The generator shall meet performance class G2 of ISO 8528. The excitation system shall enable the alternator to sustain 300% of rated current based on the 125C (Class H) rise rating for ten seconds during a fault condition and shall improve the immunity of the voltage regulator to non-linear distorting loads. The excitation system shall be of brushless construction and be independent of main stator windings (either permanent magnet or auxiliary windings).

C. Voltage Regulator
    1. Digital Voltage Regulator
        a. he digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain generator output voltage within +/- 0.25% for any constant load between no load and full load. The regulator shall be capable of sensing true RMS in three phases of alternator output voltage, or operating in single phase sensing mode. The voltage regulator shall include a VAR/Pf control feature as standard. The regulator shall provide an adjustable dual slope regulation characteristic in order to optimize voltage and frequency response for site conditions. The voltage regulator shall include standard the capability to provide generator paralleling with reactive droop compensation and reactive differential compensation.
        b. The voltage regulator shall communicate with the Generator Control Panel via a J1939 communication network with generator voltage adjustments made via the controller keypad. Additionally, the controller shall allow system parameter setup and monitoring, and provide fault alarm and shutdown information through the controller. A PC-based user interface shall be available to allow viewing and modifying operating parameters in a windows compatible environment.

D. Motor Starting

1. Provide locked rotor motor starting capability of 1900 skVA at 30% instantaneous voltage dip as defined per NEMA MG 1. Sustained voltage dip data is not acceptable.

E. Generator shall be UL 2200 listed as required by Section 2702.1.1 of the Building Code of NYS.

F. Generator installation shall comply with all requirements defined in NFPA 37.

2.3 CIRCUIT BREAKER

A. Circuit Breaker Specifications

1. Provide a generator mounted 100% circuit breaker, molded case, 600 amp trip, 3 pole, NEMA 1/IP22. Breaker shall utilize a solid state trip unit. The breaker shall be UL/CSA Listed and connected to engine/generator safety shutdowns. Breaker shall be housed in an extension terminal box which is isolated from vibrations induced by the generator set. Mechanical type lugs, sized for the circuit breaker feeders shown on drawing, shall be supplied on the load side of breaker.

2.4 CONTROLS - GENERATOR SET MOUNTED

A. Provide a fully solid-state, microprocessor based, generator set control. The control panel shall be designed and built by the engine manufacturer. The control shall provide all operating, monitoring, and control functions for the generator set. The control panel shall provide real time digital communications to all engine and regulator controls via SAE J1939.

B. Environmental

1. The generator set control shall be tested and certified to the following environmental conditions:
   a. -40°C to +70°C Operating Range
   b. 0-95% humidity non-condensing, 30°C to 60°C
   c. IP22 protection for rear of controller; IP55 when installed in control panel
   d. 5% salt spray, 48 hours, +38°C, 36.8V system voltage
   e. Sinusoidal vibration 4.3G's RMS, 24-1000Hz
   f. Electromagnetic Capability (89/336/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC, BS EN 50081-2, 50082-2)
   g. Shock: withstand 15G

C. Functional Requirements

1. The following functionality shall be integral to the control panel.
   a. The control shall include a minimum 64 x 240 pixel, 28mm x 100mm, white backlight graphical display with text based alarm/event descriptions
   b. The control shall include a minimum of 3-line data display
   c. Audible horn for alarm and shutdown with horn silence switch
   d. Standard ISO labeling
   e. Multiple language capability
   f. Weather proof manual stop station mounted to exterior of enclosure.
   g. Local run/off/auto control integral to system microprocessor
   h. timer
   i. Speed adjust
   j. Lamp test
   k. Push button emergency stop button
   l. Voltage adjust
   m. Voltage regulator V/Hz slope - adjustable
   n. Password protected system programming

D. Digital Monitoring Capability
   1. The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units
      a. Engine
         1) Engine oil pressure
         2) Engine oil temperature
         3) Engine coolant temperature
         4) Engine RPM
         5) Battery volts
         6) Engine hours
         7) Engine crank attempt counter
         8) Engine successful start counter
         9) Service maintenance interval
         10) Real time clock
         11) Oil filter differential pressure
         12) Fuel temperature
         13) Fuel pressure
         14) Fuel filter differential pressure
         15) Fuel consumption rate
         16) Total fuel consumed
      b. Generator
         1) Generator AC volts (Line to Line, Line to Neutral and Average)
         2) Generator AC current (Avg and Per Phase)
         3) Generator AC Frequency
         4) Generator kW (Total and Per Phase)
         5) Generator kVA (Total and Per Phase)
         6) Generator kVAR (Total and Per Phase)
         7) Power Factor (Avg and Per Phase)
         8) Total kW-hr
         9) Total kVAR-hr
         10) % kW
         11) % kVA
         12) % kVAR
      c. Voltage Regulation
         1) Excitation voltage
         2) Excitation current

E. Alarms and Shutdowns
   1. The control shall monitor and provide alarm indication and subsequent shutdown for the following conditions. All alarms and shutdowns are accompanied by a time, date, and engine hour stamp that are stored by the control panel for first and last occurrence:
      a. Engine Alarm/Shutdown
         1) Low oil pressure alarm/shutdown
         2) High coolant temperature alarm/shutdown
         3) Loss of coolant shutdown
         4) Overspeed shutdown
         5) Overcrank shutdown
         6) High intake manifold temperature alarm/shutdown
         7) High exhaust manifold temperature alarm/shutdown
         8) High crankcase pressure alarm/shutdown

9) High air inlet temperature alarm/shutdown
10) Emergency stop depressed shutdown
    (a) Remote manual stop station for generator in accordance with NFPA 110 Section 5.6.5.6.
    (b) Manual stop station shall be located external to the weatherproof enclosure and shall be appropriately identified.
11) Low coolant temperature alarm
12) Low battery voltage alarm
13) High battery voltage alarm
14) Control switch not in auto position alarm
15) Battery charger failure alarm

b. Generator Alarm/Shutdown
1) Generator over voltage
2) Generator under voltage
3) Generator over frequency
4) Generator under frequency
5) Generator reverse power
6) Generator overcurrent

c. Voltage Regulator Alarm/Shutdown
1) Loss of excitation alarm/shutdown
2) Instantaneous over excitation alarm/shutdown
3) Time over excitation alarm/shutdown
4) Rotating diode failure
5) Loss of sensing
6) Loss of PMG

F. Inputs and Outputs
1. Programmable Digital Inputs
a. The Controller shall include the ability to accept programmable digital input signals. The signals may be programmed for either high or low activation using programmable Normally Open or Normally Closed contacts.
2. Programmable Relay Outputs
a. The control shall include the ability to operate programmable relay output signals, integral to the controller. The output relays shall be rated for 2A @ 30VDC and consist of six (6) Form A (Normally Open) contacts and two (2) Form C (Normally Open & Normally Closed) contacts.
3. Programmable Discrete Outputs
a. The control shall include the ability to operate two (2) discrete outputs, integral to the controller, which are capable of sinking up to 300mA.

G. Maintenance
1. All engine, voltage regulator, control panel and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set control
a. Engine running hours display
b. Service maintenance interval (running hours or calendar days)
c. Engine crank attempt counter
d. Engine successful starts counter
e. 20 events are stored in control panel memory

H. Remote Communications
1. Remote Communications

a. The control shall include Modbus RTU communications as standard via RS-485 half duplex with configurable baud rates from 2.4k to 57.6k.

I. Local and Remote Annunciation
   1. Local Annunciator (NFPA 99/110, CSA 282)
      a. Provide a local, control panel mounted, annunciator to meet the requirements of NFPA 110, Level 1.
         1) Annunciators shall be networked directly to the generator set control
         2) Local Annunciator shall include a lamp test pushbutton, alarm horn and alarm acknowledge pushbutton
         3) Provide the following individual light indications for protection and diagnostics
            (a) Overcrank
            (b) Low coolant temperature
            (c) High coolant temperature warning
            (d) High coolant temperature shutdown
            (e) Low oil pressure warning
            (f) Low oil pressure shutdown
            (g) Overspeed
            (h) Low coolant level
            (i) EPS supplying load
            (j) Control switch not in auto
            (k) High battery voltage
            (l) Low battery voltage
            (m) Battery charger AC failure
            (n) Emergency stop
            (o) Low fuel level alarm
            (p) Rupture Basin Alarm

J. Remote Annunciator (NFPA 99/110, CSA 282)
   1. Provide a remote annunciator to meet the requirements of NFPA 110, Level 1.
      a. The annunciator shall provide remote annunciation of all points stated above and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn.
      b. Ability to be located up to 800 ft from the generator set.

2.5 COOLING SYSTEM

A. The generator set shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 110 F* ambient air entering the room.

2.6 FUEL SYSTEM

A. Fuel System: Natural Gas.

B. Exhaust System
   1. Silencer
      a. A hospital (super critical) grade silencer, companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation. Mounting shall be provided by the contractor as shown on the drawings. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer.

b. Exhaust system, including the piping and insulation, must be suitable for elevated temperatures, approaching 1,500 degrees F.

C. Starting System
   1. Starting Motor
      a. A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.
   2. Jacket Water Heater
      a. Jacket water heater shall be provided and shall be sized to insure that genset will start within the specified time period and ambient conditions.
   3. Batteries
      a. Batteries - A lead-acid storage battery set of the heavy-duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system.
   4. Battery Charger
      a. Battery Charger - A current limiting battery charger shall be furnished to automatically recharge batteries. The charger shall be dual charge rate with automatic switching to the boost rate when required. The battery charger shall be mounted on the genset package.

D. Sound Attenuated, Weather tight Level II Enclosure: Reinforced steel housing allowing access to control panel and service points, with lockable doors and panels. Include louvers, battery rack, and silencer. Enclosure shall have a DBA of 72.4 at 23'-0". Provide 120 V lighting with switch and emergency battery pack light fixture within enclosure. Provide remote manual stop station located on exterior of enclosure, and identify appropriately.

E. Gas Train
   1. Provide manual shut-off valve.
   2. Regulator with vent and control line (if required by the regulator design).
   3. (2) Factory installed automatic safety shutoff valves to shutoff the fuel supply to the prime mover in the event the prime mover stops for any reason.
   4. Manual leak test valves or automatic safety shutoff valves incorporating integral test ports.
   5. Factory installed low pressure gas switch for all Level I emergency generators.
   6. Inlet gas pressure shall be 11" of water column or less as measured at the frame rail.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's recommendations, the project drawings and specifications, and all applicable codes.

B. Comply with all requirements defined in NFPA 37.

C. The existing generator will need to be removed from the existing building through the existing door.

3.2 START-UP AND TESTING

A. Pre-acceptance Test
   1. Contractor/ generator vendor shall preform a pre-acceptance test of the generator at least two weeks prior to the NFPA 110 Acceptance Test. The purpose of the pre-acceptance test is to verify the generator can start and transfer load within 10 seconds, and that the generator is ready for the Acceptance Test. The Pre-acceptance Test shall be preformed by a factory trained technician. Operate

generator long enough it to assure it is operating properly, verify it runs, accepts loads, all the transfer switches transfer in appropriate amount of time. Determine if the system is suitable to conduct an Installation Acceptance Test. Verify all devices scheduled to be on the generator are installed and operational. Versify the annunciator and manual stop button are operating. Consideration should be given to including a full load bank test in the pre-acceptance testing to confirm proper operation, and not requiring re-tests. Verify that dampers open and ancillaries operate properly. Check and adjust equipment. Set time delays. The DASNY Project Manager or Field Representative shall witness this test.

B. Coordinate all start-up and testing activities with the Owner. After installation is complete and normal power is available. Verify Pre-Test is complete, and successful. Verify each item on Construction Check List for PM/Contractor is complete.
   1. Contractor/vendor shall perform an NFPA 110 Acceptance Test as defined in section 7.13 Installation Acceptance.
   2. Provide use of a load bank to permit the full load testing required per NFPA 110.
   3. Coordinate with DASNY as the Acceptance test must be witnessed by a DASNY Representative.
   4. Verify the following:
      a. Verify that the equipment is installed properly.
      b. Check all auxiliary devices for proper operation, including battery charger, jacket water heater, remote annunciator, etc.
      c. Test all alarms and safety shutdown devices for proper operation and annunciation.
      d. Check all fluid levels.
      e. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
      f. Connect the Generator Set to resistive load bank, test each unit separately with load bank sized at 100% of nameplate rating.
      g. Provide a NFPA 110 installation acceptance test which includes a 1.5 hour building load test followed immediately with a 2 hour full load test. The full load test will be performed using a contractor supplied 150 kW minimum resistive load bank.
      h. Monitor the following readings at 15 minute intervals:
         1) Oil pressure
         2) Coolant temperature
         3) Battery charge rate
         4) AC volts
         5) AC Amperes- all phases
         6) Frequency
         7) Kilowatts
         8) Ambient Temperature
      i. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
      j. Start the generator set(s) via the paralleling switchgear, parallel generator sets to the emergency bus. Connect the generator set(s) to building load and verify that the generator will start and run all designated loads.
      k. The system shall be tested under full load for two (2) hours and monitor the following readings on each generator set:
         1) Oil pressure
         2) Coolant temperature
         3) Battery charge rate
         4) AC volts

5) AC Amperes-all phases
6) Frequency
7) Kilowatts
8) Ambient Temperature

l. Perform simulated outage, record time for each unit to start and close to the bus. Record time for all units to close and synchronize.

m. Confirm gas service supplying the building and generator has adequate capacity to serve all loads, by energizing all gas supplied equipment during the generator full load test.

3.3 OPERATION AND MAINTENANCE MANUALS

A. Provide three (3) sets of operation and maintenance manuals covering the generator, switchgear, and auxiliary components. Include final as-built wiring interconnect diagrams and recommended preventative maintenance schedules.

3.4 TRAINING

A. On-Site Training

1. Provide 6 hours of on-site training to instruct the owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

END OF SECTION

SECTION 263600
TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SCOPE

A. It is the intent of this specification to secure a transfer switch that has been prototype tested, factory built, production tested and site tested. A transfer switch with the number of poles, voltage and current ratings shown on the plans and specified herein shall be provided.

1.2 CODES AND STANDARDS

A. The automatic transfer switch shall conform to the requirements of:
   1. UL 1008: Underwriters Laboratories standard for automatic transfer switches
   2. CSA: C22.2 No. 178 certified
   3. IEC: 947-6-1 certified at 480 VAC
   4. NFPA 70: National Electrical Code including use in emergency and standby systems in accordance with Articles 517, 700, 701, 702.
   5. NFPA 99: Essential electrical systems for health care facilities
   6. NFPA 101: Life safety code
   7. NFPA 110: Standard for emergency and standby power systems
   8. IEEE 241: I.E.E.E. recommended practice for electrical power systems in commercial buildings
   9. IEEE 446: I.E.E.E. recommended practice for emergency and standby power systems
   10. NEMA ICS10:AC automatic transfer switch equipment
   11. UL 50/508: Enclosures
   12. ICS 6: Enclosures
   13. ANSI C33.76:Enclosures
   14. NEMA 250: Enclosures
   15. IEEE 472: (ANSI C37.90A): Ringing wave immunity
   16. EN55022 (CISPR11): Conducted and radiated emissions (Exceeds EN55011 & MILSTD 461 Class 3)
   17. EN61000-4-2:(Level 4): ESD immunity test Class B:
   18. EN61000-4-3:(ENV50140): Radiated RF, electromagnetic field immunity
   19. EN61000-4-4: Electrical fast transient/burst immunity test
   20. EN61000-4-5: IEEE C62.41: Surge immunity test (1.2 x 50s, 5 & 8 kV)
   21. EN61000-4-6:(ENV50141): Conducted immunity test
   22. EN61000-4-11: Voltage dips and interruption immunity

1.3 MANUFACTUERS

A. ASCO Power Technologies, LP: www.asco.com.

B. Russlectric: www.russelectric.com.

C. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND CONSTRUCTION

A. The automatic transfer switch shall be of double throw construction operated by a reliable solenoid driven mechanism. There shall be a direct mechanical coupling to facilitate transfer in 6 cycles or less.

B. The normal and emergency contacts shall be mechanically interlocked such that failure of any coil or disarrangement of any part shall not permit a neutral position.

C. For switches installed in systems having ground fault protective devices, and/or wired so as to be designated a separately derived system by the NEC, a 4th pole shall be provided. This additional pole shall isolate the normal and emergency neutrals. The neutral pole shall have the same withstand and operational ratings as the other poles and shall be arranged to break last and make first to minimize neutral switching transients. Add-on or accessory poles that are not of identical construction and withstand capability will not be considered.

D. The contact structure shall consist of a main current carrying contact, which is a silver alloy with a minimum of 50% silver content. The current carrying contacts shall be protected by silver tungsten arcing contacts on all sizes above 400 Amps.

E. The transfer switch manufacturer shall submit test data for each size switch, showing it can withstand fault currents of the magnitude and the duration necessary to maintain the system integrity. Each ATS shall be in strict accordance and listed to UL 1008 withstand standards, including 3 cycle ratings.

F. A dielectric test at the conclusion of the withstand and closing tests shall be performed.

G. The automatic transfer switch manufacturer shall certify sufficient arc interrupting capabilities for 50 cycles of operation between a normal and emergency source that are 120 degrees out of phase at 480 volts, 600% of rated current at .50 power factor. This certification is to ensure that there will be no current flow between the two isolated sources during switching.

H. All relays shall be continuous duty industrial type with wiping contacts. Coils, relays, timers and accessories shall be readily front accessible. The control panel and power section shall be interconnected with a harness and keyed disconnect plugs for maintenance.

I. Main and arcing contacts shall be visible without major disassembly to facilitate inspection and maintenance.

J. A manual handle shall be provided for maintenance purposes with the switch de-energized. An operator disconnect switch shall be provided to defeat automatic operation during maintenance, inspection or manual operation.

K. Switches composed of molded case breakers, lighting contactors or components thereof will not be acceptable.

L. The current rating shall be a continuous rating when the switch is installed in an enclosure, and shall conform to NEMA temperature rise standards.

M. The unit shall be rated based on all classes of loads, i.e., resistive, tungsten, ballast and inductive loads. Switches rated 400 amperes or less shall be UL listed for 100% tungsten lamp load.

N. Temperature rise tests in accordance with UL 1008 shall have been conducted after the overload and endurance tests to confirm the ability of the units to carry their rated currents within the allowable temperature limits.

O. Unless specified otherwise on the drawings, the switch shall be mounted in a NEMA 1 enclosure.

2.2 CONTROL

A. The control panel shall be opto-isolated from electrical noise and provided with the following inherent control functions and capabilities:
   1. Easy-to-view 4x20 LCD display with long lasting LED indicators.
   2. Control panel shall display voltage and frequency of both sources.
   3. The user shall be able to view the last 16 recorded events.

4. Capability for external communication and network interface.
5. Adjustments to all settings shall be made from the front of the panel without opening the door.

B. The transfer switch shall be equipped with a microprocessor based control panel. The control panel shall perform the operational and display functions of the transfer switch. The display functions of the control panel shall include ATS position, source availability, sequence indication and diagnostics.

C. All programmable and control functions shall be pass code protected and accessible through the keypad.

D. The control panel shall be provided with a simple user interface for transfer switch monitoring, control and field changeable functions and settings.

E. Touch pad test switch with Fast Test/Load/No Load selection capability to simulate a normal source failure.

F. The controller shall provide digital timer adjustments with 1-second resolution. Voltage and Frequency shall be adjustable to 1% resolution to facilitate accurate transfer.

G. To ensure reliable and consistent user operation the controls must be equipped with nonvolatile memory and allow automatic daylight savings time adjustment.

H. The controller shall include a built in synchroscope to display the phase angle differential and ensure disturbance-free transfer operation between sources.

PART 3 - OPERATION

3.1 SEQUENCE OF OPERATION

A. The ATS shall incorporate adjustable three phase under/over voltage and frequency sensing on the normal source.

B. When the voltage of any phase of the normal source is reduced to 80% of nominal voltage, for a period of 0-10 seconds (programmable) a pilot contact shall close to initiate starting of the engine generator.

C. The ATS shall incorporate adjustable three phase under/over voltage and frequency sensing on the emergency source.

D. When the emergency source has reached a voltage value of 90% of nominal and achieved frequency within 95% of the rated value, the load shall be transferred to the emergency source after a programmable time delay.

E. When the normal source has been restored to not less than 90% of rated voltage on all phases, the load shall be retransferred to the normal source after a time delay of 0 to 60 minutes (programmable). The generator shall run unloaded for 5 minutes (programmable) and then automatically shut down. The generator shall be ready for automatic operation upon the next failure of the normal source.

F. If the engine generator should fail while carrying the load, retransfer to the normal source shall be made instantaneously upon restoration of proper voltage (90%) on the normal source.

3.2 STANDARD ACCESSORIES

A. Adjustable time delay to override momentary normal source failure prior to engine start. Field programmable 0-10 seconds factory set at 3 seconds.

B. Adjustable time delay on retransfer to normal source, programmable 0-60 minutes factory set at 30 minutes. If the emergency source fails during the retransfer time delay, the transfer switch controls shall automatically bypass the time delay and immediately retransfer to the normal position.

C. A time delay on transfer to emergency, programmable 0-5 minutes, factory set at 1 second.

D. An in-phase monitor shall be provided. The monitor shall compare the phase angle difference between the normal and emergency sources and be programmed to anticipate the zero crossing point to minimize switching transients.

E. An exerciser timer with momentary test pushbutton shall be incorporated within the microprocessor and shall be capable of starting the engine generator set and transferring the load (when selected) for exercise purposes on a daily, weekly or monthly basis. The exerciser shall contain a battery for memory retention during an outage.

F. Provide a momentary pushbutton to bypass the time delays on transfer and retransfer and programmable commit/no commit control logic.

G. A set of customer contacts shall be provided to indicate both emergency and normal source position.

H. An adjustable over/under frequency and voltage sensor for both emergency and normal sources.

I. Indication of switch position and source acceptability shall be provided for both emergency and normal sources.

J. An engine start contact with an adjustable cool down timer.

K. A three phase Voltage Imbalance Monitor shall detect an imbalance and initiate a transfer to the alternate source. Adjustable 5-20% of nominal with a time delay of 10-30 seconds for nuisance conditions.

L. The following optional accessories shall be included:
   1. Additional Auxiliary Contact (A3) - Closed when the transfer switch is in Source 2 position.
   2. Additional Auxiliary Contact (A4) - Closed when the transfer switch is in Source 1position.
   3. Programmable Clock Exerciser (CDP) - This will replace the timer exerciser and allow for a 365 day cycle.
   4. Peak Shave/Remote Test (Q2) - The controller shall accept a remote peak shave or test input to signal the transfer switch to the emergency position.
   5. Phase Rotation Sensing (R16) - Rotation shall be monitored on both sources.
   6. Universal Motor Load Disconnect (UMD) - Auxiliary contacts opens 0 - 5 minutes prior to transfer in either direction, re-closes after transfer. Can be configured for pre-transfer, post transfer or both.
   7. Communications interface card (ZNETM) - RS-485 Modbus
   8. Test Switch (6A) - Maintained
   9. Additional Auxiliary Contacts (A3) - Closed when the transfer switch is in Source 2 position.
   10. Disconnect Switch (DS) - Inhibits transfer in either direction when in inhibit. (Std on 600A and above)
   11. Inhibit transfer (Q3) - Provides additional relay (specify voltage) to inhibit transfer to Emergency.
   12. Inhibit transfer (Q7) - Provides additional relay (specify voltage) to inhibit transfer to Normal.
   13. Load Shed (R15) - Provisions to transfer source 2 or Emergency to normal or neutral (delayed switches only) position. Specify voltage.
   14. Automatic or Manual Selector (S12) - Provide ability to manually transfer to Normal or Emergency sources.

15. Auxiliary Contact (AB3) - Closed in emergency bypass.
16. Auxiliary Contact (AB4) - Closed in normal bypass.

M. ATS is to be a 4 pole, and is to be compatible with generator.

PART 4 - EXECUTION

4.1 GENERAL

A. The transfer switch shall be installed as shown on the plans, in accordance with the manufacture's recommendations and all applicable codes.

4.2 FACTORY TESTS

A. The transfer switch manufacturer shall perform a complete functional test on the switch, controller and accessories prior to shipping from the factory. A certified test report shall be available upon request.

4.3 STARTUP/TESTING

A. Provide a 1.5 hour NFPA 110 Building Load Test to be performed on the transfer switch.

B. The test is to be performed by a factory trained field technician. The test must be witnessed by the owners representative and a minimum of 3 days advanced notice is required.

4.4 SERVICE

A. The manufacturer shall maintain a national service organization that is factory trained and certified for transfer switch equipment. In addition, the service organization shall be available 24 hours per day, 365 days per year.

4.5 WARRANTY

A. The automatic transfer switch shall be warranted against defective workmanship

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior lighting fixtures and accessories.

B. Exit signs.

C. Fixture accessories.

1.2 REFERENCE STANDARDS

A. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 101 - Life Safety Code; 2015.

D. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

E. LM-79-08, IESNA Approved Method for Electrical and Photometric Measurements of Solid-State lighting products.

F. LM-80-08, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources.

G. IES TM-21-01: Projecting Long Term Lumen Maintenance of LED Light Sources.

H. ANSI: C78.377A, C82.77-2014

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.

B. Product Data:
   1. Provide dimensions, ratings, and performance data.
   2. Energy-efficiency data.
   3. Life expectancy, output (lumens, color temperature, color-rendering index).
   4. Photometric data based on an independent testing company. LED fixture photometrics produced by Photopia is not acceptable.
   5. LED replacement board and driver information: Provide verification without removing or replacing the light fixture, that all LED boards and drivers within any submitted LED fixture are replaceable. Full replacement cost of LED boards shall not exceed 50% of the fixture cost or $75.00, whichever is greater. Provide estimate of replacement kit.

C. Submit product data, photometrics of each space and provide sample of each fixture for consideration of comparable products for Architects, Engineers and college review. Incomplete submission will be returned and marked as incomplete.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

B. Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
   1. provided by an independent agency, with the experience and capability to conduct testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 , accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Color Binning: Each LED luminaire shall be binned within a three step MacAdam Ellipse.

1.5 LED WARRANTY

A. All LED luminaires shall carry full warranty in which the manufacturer agrees to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: five years from the date of Substantial Completion.

1.6 EXTRA MATERIALS

A. Furnish two of each plastic lens type.

B. LED boards and drivers:
   1. Full replacement for 5% of installed lighting fixture quantity for each luminaire type.
   2. Not less than 1 full replacement for each fixture type.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR INTERIOR LIGHTING FIXTURES

A. Provide products that comply with requirements of NFPA 70 and NFPA 101.

B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. LED LUMINAIRE REQUIREMENTS:
   1. Provide luminaires that have fully replaceable LED boards and drivers without removing or replacing the luminaire. Full replacement of LED boards and drivers shall not exceed $75.00 or 50% of the luminaire cost.
   2. Provide with minimum 5 year warranty.
   3. L70 Rated life of not less than 50,000 hours, or as listed on Lighting Fixture Schedule. Lumen Maintenance properties shall be tested based on IES standard LM-80.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

2.2 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings.

2.3 HIGH EFFICIENCY LED FLAT PANELS - 2'X4', 2'X2'- TOPAZ LIGHTING

A. General Specifications:
   1. Power Factor -0.95, THD < 15%
   2. Average Rated Life: 50,000 (L70)
   3. Dimming 100%-10%
   4. Color: Temperature CCT Uniformity SDCM 4, 35000 K

B. Panel Construction
   1. Gasket
   2. LED Driver
   3. EVA foam
   4. Reflective film 0.3mm
   5. PMMA light guide 3mm Mitsubishi
   6. Diffuser 1.2mm
   7. Steel Frame
   8. LED/chip
   9. Safety clips (4)

2.4 EXIT SIGNS

A. Exit Signs: Exit sign fixture suitable for use as emergency lighting unit.
   1. Provide fixtures complying with NFPA 101.
   2. Lamps: LED.
   3. Mounting: As indicated.

2.5 EXIT SIGNS

A. Directional Arrows: Universal type for field adjustment.

B. Mounting: Universal

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

B. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

C. Support luminaires from concrete structure above, not from ceiling grid.

D. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

E. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

F. Install recessed luminaires to permit removal from below.

G. Install clips to secure recessed grid-supported luminaires in place.

H. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Architectural Elevations.

I. Install accessories furnished with each fixture.

J. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

K. Connect luminaires and exit signs to branch circuit outlets provided under Section 260537 using flexible conduit.

L. Provide engraved plastic nameplates; refer to Section 26 0553 for product requirements and location.

M. Bond products and metal accessories to branch circuit equipment grounding conductor.

N. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

P. Provide a red dot sticker on all emergency lighting fixtures, for easy identification. Coordinate with campus representative.

3.2 FIELD QUALITY CONTROL

A. Operate each fixture after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

A. Aim and adjust fixtures as indicated.

3.4 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosures.

C. Clean finishes and touch up damage.

3.5 PROTECTION

A. Relamp luminaires that have failed lamps at Date of Substantial Completion.

3.6 CLOSEOUT

A. Provide a spread sheet showing emergency lighting circuits in the building. This spread sheet shall contain a column for the location of the light fixtures, a column for what panel and circuit it is fed from, a column for the date of inspection. Coordinate with owner for exact requirements. See example below.

DEVICE LOCATION	**POWER SOURCE**	**DATE OF INSPECTION**	**OK OR DEFICIENT**	**DESCRIBE DEFICIENCY**	**CORRECTIVE ACTION TAKEN**
REAR OUTSIDE LIGHTS	PANEL EP-C1 #3				
EM LT IN ATS ROOM	PANEL EP-C1 #4				
REAR OUTSIDE LIGHTS	PANEL EP-C1 #7				

END OF SECTION

SECTION 265600
EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires and accessories.

1.2 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

C. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

B. Product Data:
   1. Provide dimensions, ratings, and performance data.
   2. Energy-efficiency data.
   3. Life expectancy, output (lumens, color temperature, color rendering index).
   4. Photometric data based an independent testing company. LED fixture photometrics produced by Photopia is not acceptable.
   5. LED replacement board and driver information: Provide verification without removing or replacing the light fixture, that all LED boards and drivers within any submitted LED fixture are replaceable. Full replacement cost of LED boards shall not exceed 50% of the fixture cost or $75.00, whichever is greater. Provide estimate of replacement kit.

C. Submit product data , photometrics of each area and provide sample of each fixture for consideration of comparable products for Architects, Engineers and college review. Incomplete submission will be returned and marked as incomplete.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
   1. Provided by an independent agency, with the experience and capability to conduct testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with applicable IES testing standards.

C. Color Binning: Each LED luminaire shall be binned within a three step MacAdam Ellipse.

D. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 WARRANTY

A. All LED luminaires shall carry full warranty in which the manufacturer agrees to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Ten years from the date of Substantial Completion.

1.6 EXTRA MATERIALS

A. Furnish one gallon of touch-up paint.

B. LED boards and drivers:
   1. Full replacement for 5% of installed lighting fixture quantity for each luminaire type.
   2. Not less than 1 full replacement for each fixture type.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Furnish products as indicated in Schedule included on the Drawings.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

E. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

F. Provide luminaires that have fully replaceable LED boards and drivers without removing or replacing the luminaire.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 501.

B. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

C. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

3.2 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

3.3 ADJUSTING

A. Aim and adjust luminaires to provide illumination levels and distribution as directed.

3.4 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.5 CLOSEOUT

A. Provide a spread sheet showing emergency lighting circuits in the building. This spread sheet shall contain a column for the location of the light fixtures, a column for what

panel and circuit it is fed from, a column for the date of inspection. Coordinate with owner for exact requirements. See example below.

DEVICE LOCATION	POWER SOURCE	DATE OF INSPECTION	OK OR DEFICIENT	DESCRIBE DEFICIENCY	CORRECTIVE ACTION TAKEN
Rear Outside Lights	Panel EP-C1 #3				
EM LT in ATS Room	Panel EP-C1 #4				
Rear Outside Lights	Panel EP-C1 #7				

END OF SECTION

SECTION 271010
STRUCTURED TELECOMMUNICATIONS CABLING AND ENCLOSURES

PART 1 - GENERAL REQUIREMENTS

1.1 SECTION INCLUDES

A. Cabling and pathways inside building(s).

B. Distribution frames, cross-connection equipment, enclosures, and outlets.

C. Grounding and bonding the telecommunications distribution system.

1.2 REFERENCES

A. CEA-31 0 - Cabinets, Racks, Panels, and Associated Equipment; Consumer Electronics Association.

B. NFPA 70 - National Electrical Code.

C. C. TIA-492AAAB - Detail Specification for 50-urn Core Diameter/i 25-urn Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers.

D. TIA-526-1 4 - OFSTP-i 4 - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

1.3 TIA/EIA-568-B.2 - COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD - PART 2: BALANCED TWISTED PAIR CABLING COMPONENTS.

A. TIA/EIA-568-B.3 - Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling Components Standard, and Addendum 1 - Additional Transmission Performance Specifications for 50/125 um Optical Fiber Cables..

B. TIA-/EIA-569-D-1- Commercial Building Standard for Telecommunications Pathways and Spaces.

C. TIA/EIA-606 - Administration Standard for the Telecommunications Infrastructure.

D. ANSI/J-STD-607 - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

E. UL 444 - Communications Cables.

F. UL 1863- Standard for Communications-Circuit Accessories.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Installation methods.

B. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD). Provide RCDD's information to verify current certification.
   1. Provide detailed drawings for telecom closets showing rack positions in data rooms, rack layouts, room layouts, patch panel choice and placement, along with cable management, drawings need to be provided prior to rough-in for campus approval.

C. Manufacturer Qualifications.

D. Installer Qualifications.

E. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

F. Field Test Reports: Submit all reports in electronic format.

G. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on contract drawings.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

I. Provide a spreadsheet of what wiring labels correspond to what rooms foe lighting AP's before students move in, and turn over to campus IT staff. Provide with testing details well before network is expected to light wired and wireless networking.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

B. Installer Qualifications: A company certified by the chosen manufacturer for a minimum of 3 years and having at least 3 years experience in the installation and testing of the cable system specified.
   1. Submittals must include manufacturer certification showing date of certification and that certification is current.
   2. Supervisors and installers factory certified by manufacturers of products to be installed.
   3. Employing BICSI ITS installer 2, copper training - with a minimum 3 years experience for all work.
   4. Provide technicians information to verify certification.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cabling and Equipment:
   1. Systimax/Commscope XL category 6 with Gigaspeed XL 2071 Category 6 UTP cable, slate jacket or approved equal.
   2. Systimax X10D category 6A with Gigaspeed X10D MGS600 series information Outlet for use with all riser applications.

2.2 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets as indicated on the Drawings. The category 6 Data system shall be an integrated high-performance system with all Cat 6 cable, patch panels, jacks, and other components manufactured by the same manufacturer and warranted for minimum of 20 years. Basis of Design is Commscope Systimax GIGASPEED XL7 system.
   1. Comply with TIA/EIA-568-D and TIA/EIA-569-D-1, latest editions.
   2. Provide fixed cables and pathways that comply with NFPA 70 and ANSI/J-STD-607 and are UL listed or third party independent testing laboratory certified.
   3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
   4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. B. Main Distribution Frame (MDF): Centrally located support structure for terminating ( ), riser cables functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.
   2. Capacity: As required to terminate all cables required by design criteria, maximum fill for conduits is 40%. Provide 25% spare space, this includes adding conduits as required.

C. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
   1. Locate intermediate distribution frames as indicated on the drawings.

D. Riser Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star. All riser cables are to be category 6A. Catagory 6 riser cables will not be accepted.

E. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links'. All horizontal cabling shall be category 6.

2.3 PATHWAYS

A. Conduit: As specified in EIA/TIA 569-A, Commercial Building Standards for Telecommunications and Spaces provide pull cords in all conduits.

B. Cable Trays: As specified in EIA/TIA 569-A, Commercial Building Standards for Telecommunications and Spaces.

2.4 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable: TIA/EIA-568-D Category 6 solid conductor unshielded twisted pair (UTP), 24 AWG, 100 ohm; 4 individually twisted pairs; covered with grey jacket for data or voice, complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444.

B. Copper Riser Cabling: TIA/EIA-568-D Category 6A solid conductor unshielded twisted pair (UTP), 23 AWG, 100 OHM; 4 individually twisted pairs; covered with grey jacket, complying with all relevant parts of and addenda to latest edition of TIA/EIA-568-D and UL 444.

C. 1, In locations other than in plenums, provide, NFPA 70 type CMG general purpose, CMR riser rated, or type CMP plenum rated cable.
   1. In plenums, provide NFPA 70 type CMP plenum-rated cable.
   2. Testing: Furnish factory reel tests.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool.

E. Jacks and Connectors: RJ-45, non-keyed, terminated with 110-style insulation displacement connectors; high impact thermoplastic housing; complying with same standard as specified horizontal cable and UL 1863.
   1. Performance: 500 mating cycles.
   2. Voice Jacks: Blue, 4-pair, pre-wired to T568B configuration.
   3. Data Jacks: Blue, 4-pair, pre-wired to T568B configuration.
   4. Cat 6 terminations shall be type B.

2.5 FIBER OPTIC CABLE AND ADAPTORS

A. Fiber Optic Backbone Cable: Hybrid-fiber, with 12 strand (6-pair) Single-mode 8/1 25um complying with TIA-492AAA; covered with orange cable jacket and complying with relevant portions of and addenda to latest edition of TIA/EIA-568-D.

1. In locations other than in plenums, provide NFPA 70 type OFNR nonconductive-riser rated or type OFNP nonconductive-plenum-rated cable.
2. In plenums, provide NFPA 70 type OFNP nonconductive-plenum-rated cable.
3. Testing: Furnish factory reel tests.

B. Fiber Optic Adapters and Connectors: Duplex SC, push-on-push-off type, single mode adaptors with zirconia ceramic alignment sleeves; complying with relevant parts and addenda of TIA/EIA-568-D and maximum attenuation of 0.3 dB at 1310 and 1550. Corning UPC, or accepted equal.

2.6 CROSS-CONNECTION EQUIPMENT

A. Patch Panels for Copper Voice or Data Cabling: Sized to fit EIA standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated with 50 -pin RJ-21 (Amphenol) connectors.
1. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
2. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
3. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers. Labels should be as follows: (Same on both ends) - IDF Room # - Rack# (If multiple) - Patch panel letter (A at top Z at bottom) - Numerical location in patch panel. For example - "101-2-A-34" = IDF 101, Rack 2, Patch Panel A, Jack 34.
4. Provide incoming cable strain relief and routing guides on back of panel.
5. Patch Cords: Provide one patch cord for each patch panel port. Patch cords to be Spring Green for data, 10% should be white for VOIP or analog dial-tone. Length to be determined by needs of SUNY Telecommunications based on rack and equipment locations, minimum 7 feet maximum 14 feet.

B. Patch Panels for Fiber Optic Cabling: Sized to fit EIA standard 19 inch wide equipment racks; 0.09 inch thick aluminum.
1. Adaptors: As specified above under FIBER OPTIC CABLING; maximum of 24 adaptors per standard panel width.
2. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA/EIA-606 using encoded identifiers.
3. Provide incoming cable strain relief and routing guides on back of panel.
4. Provide rear cable management tray at least 8 inches deep with removable cover.
5. Provide dust covers for unused adaptors.
6. Patch Cords: Provide one patch cord for each pair of patch panel ports.

2.7 ENCLOSURES

A. Backboards: Interior grade plywood without voids (Grade AC, with “A” side out), 3/4 inch thick; UL-labeled fire-retardant.
1. Provide backboards on three walls of each Communication closet, per College Telecom direction.
a. Paint with 2 coats of flat grey fire-retardant paint. Do not paint over UL label.

B. Equipment Racks and Cabinets: CEA-31 0 standard 19 inch wide component racks.
1. Wall Mounted Racks: 18” deep, MINIMUM 49” high; with front swing gate; black finish.
2. Standard Floor Mount Racks: As applicable, must be pre-approved by SUNY Telecommunications.

3. Provide 2U cable management per 2U patch panel. Provide 2U cable management per 1U switch.
4. Face Plates: Location of face plates should not coincide with the end of the student bed.

C. Outlet Boxes: For flush mounting in walls; depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
1. Size, Unless Otherwise Indicated: 4 inches square by 2-1/8 inches deep.
2. Wall-Mounted Telephones: 4 inches high by 2 inches wide by 2-1/8 inches deep.
3. Faceplates: High impact thermoplastic, complying with system design standards and UL 514C.
4. Labels: Comply with TIA/EIA-606 using encoded identifiers; label each jack on the face plate as to its function with a unique numerical identifier.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA/EIA-568, TIA/EIA-569; ANSI/J-STD-607, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with latest editions and addenda of TIA-570, ANSI/J-STD-607, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

3.2 PATHWAYS

A. Install with the following minimum clearances:
1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches from power conduits and cables and panelboards.
3. 5 inches from fluorescent and high frequency lighting fixtures.
4. 6 inches from flues, hot water pipes, and steam pipes.

B. Conduit:
1. Do not install more than 2 (two) 90 degree bends in a single horizontal cable run.
2. Leave pull cords in place where cables are not initially installed.
3. Conceal conduit under floor slabs and within finished walls, ceilings, and floors except where specifically indicated to be exposed.
4. Conduit may remain exposed to view in mechanical rooms, electrical rooms, and telecommunications rooms.
5. Treat conduit in crawl spaces and under floor slabs as if exposed to view.
6. Where exposed to view, install parallel with or at right angles to ceilings, walls, and structural members.
7. fill shall not exceed 40%. Each conduit end shall be equipped with protective insulator.

C. Grounding and Bonding: Perform in accordance with ANSI/J-STD-607 and NFPA 70.

D. Firestopping: Seal openings around pathway penetrations through fire-rated walls, partitions, floors, and ceilings in accordance with Section 07270.

E. All cable shall be in conduit or cable tray as indicated on drawings.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius-of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.

3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
5. Cable termination documentation must be turned over to campus IT prior to telecommunication room completion.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches.
2. At. Outlets - Copper: 12 inches.

C. Copper Cabling:
1. Category 6: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
3. Provide (2) spares to the furthest point from the closet in each wing. cable shall be a different color.
4. Cat6 terminations shall be type B
5. Category 6A: Terminate as per manufacturer.

D. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

E. Field-Installed Labels: Comply with TINEIA-606 using encoded identifiers.
1. Cables: Install color coded labels on both ends.
2. Outlets: Label each jack on its face plate as to its type and function, with a unique numerical identifier.
3. Patch Panels: Label each jack as to its type and function, with a unique numerical identifier.
4. Conduits: Label each end of each conduit with its destination. For example, one end is labeled “To room 130, and the other end is labeled “To room 100”.

F. Telecomm rooms need to be turned over in clean and secure state, a minimum of 21 days in advance of building turnover.

G. Network Switches and wireless access devices will be provided and installed by the campus. Contractor responsible for all wiring, terminations and testing.

3.4 TESTING

A. UTP Cable Testing - Riser and inter-building distribution cable testing: Each cable pair within all UTP riser cables shall be tested for continuity to ensure conductors are terminated in proper sequence, with correct polarity (tip and ring), and without conductor-to-conductor shorts, conductor-to-ground shorts, or opens.

B. Horizontal Cable Testing - All UTP station cables shall be tested to prove compliance with the current industry standard, TIA-568-B.2-1 Part 2: Balanced Twisted Pair Cabling Components, Addendum 1 - Transmission Performance Specifications for 4-pair 100 ohms Category 6 Cabling and any subsequent addenda. Channel tests are the only acceptable test format for testing Category 6 cabling. Link test will not be sufficient.

C. Horizontal Cable Testing Equipment - The testing of UTP station cables shall be performed using the recommended test equipment specifically designed to test cables for all Category 6 parameters from 0 - 250 MHz. Testers shall be loaded with the most recent test values per the above referenced standard. The contractor may be

required to provide documentation (or demonstration) that the testers used are properly programmed as described above.

D. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-A including applicable Technical Service Bulletins and amendments. The appropriate level III tester shall be used to verify Category 6 cabling systems.

E. Fiber Optic Cable Testing
   1. Inter-building cable testing requirements:
      a. Test multi-mode strands at 850 nm and 1300 nm.
      b. Test single-mode strands at 1310 nm and 1550 nm.
      c. Use optical time domain reflectometer (OTDR) for tests.
      d. Record signature trace, length, and attenuation.

F. Submission prior to acceptance, the contractor shall submit a copy of all applicable test results to the Owner/Technology Consultant in both electronic (file) and paper form.

G. Category 6 and 6A UTP cables - Each cable type should be tested to conform to its associated EIA/TIA and manufacturer's specification for the specific category of cable. The test results submitted for Category 6 and 6A UTP cables shall include the following:
   1. Graphical/numerical data. Both graphical data plots and numerical are required for the following test parameters:
      a. NEXT
      b. PS NEXT
      c. ELFEXT
      d. PS ELFEXT
      e. Attenuation
      f. Return loss
   2. Numerical data. Numerical data only is required for the following test parameters:
      a. Propagation delay
      b. Delay skew
      c. Resistance

H. UTP Riser Cables - Continuity tests shall be performed on each pair. The contractor shall submit a document confirming that these cables were tested satisfactorily per these guidelines.

END OF SECTION

SECTION 275117
INTERTELECOMMUNICATION AND MASS NOTIFICATION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mass Notification System per the Campus Standards

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260537 - Boxes.

C. Section 283100 - Fire Detection And Alarm

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NEC - National Electric Code.

C. ANSI - American National Standards Institute.

D. NEMA - National Electric Manufacturers Association.

E. EIA/TIA - Electric/Telecommunications Industries Association.

F. BICI - Building Industry Consulting International.

G. UL - Underwriters Laboratories.

H. ASA - American Standards Association.

I. FCC - Federal Communications Commission.

J. OSHA - Occupational Safety and Health Administration.

K. ASTM - American Society of Testing Materials.

L. UBC - Uniform Building Code.

M. ADA - American's with Disabilities Act

N. NFPA 72 (2010)

1.4 SYSTEM DESCRIPTION

A. The mass notification system will seamlessly integrate into a voice-capable FACP utilizing contact closure and line level audio, using the fire alarm system speakers. The system will communicate using the universal wires interface and IPC communicator.

1.5 SUBMITTALS

A. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of field wiring to speakers and remote input devices.

B. Product Data: Provide data showing electrical characteristics and connection requirements for each component.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Operation Data: Include instructions for adjusting, operating, and extending the system.

G. Maintenance Data: Include repair procedures and spare parts documentation.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and Federal Communications Commission.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience with service facilities within 150 miles of Project - "Manufacturer's Support Letter".

C. Supplier Qualifications: Authorized and supported factory distributor of specified manufacturer with minimum five years documented experience. Distributor shall provide manufacturer's documentation that they are certified to sell, install, and maintain equipment being proposed.

D. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 150 miles of Project. Installers shall be documented factory trained technicians. Installers who have factory trained technicians in other offices, not serving this territory, shall not be qualified and will be rejected.

E. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cooper Notification systems.

B. This product is Proprietary as approved by DASNY as a sole source exempt material to meet the college requirements. No product substitutions will be considered.

C. The Contractor for this work shall be held to have read all of the Bidding Requirements, the General Requirements, and Contract Proposal Forms; and in the execution of this work, he will be bound by all of the conditions and requirements therein.

D. The contractor shall be responsible for providing a complete functional system including all necessary components whether included in this specification or not.

E. Provide all programming as required for new and existing equipment for a fully operational system.

F. In preparing the bid, the bidder should consider the following:
   1. No claim will be made against the owner for any costs incurred by the bidder for any equipment demonstrations which the owner requests.

2.2 SYSTEM DESIGN

A. System designed is based on the Cooper Notification Waves network system.

2.3 COMPONENTS

A. IPC IP Communicator:
   1. The communicator can act as a end-node as well as a relay, extending the reach of the network to cover all areas of interest.
   2. Capable of driving audible, visual and other data devices.
   3. Fully-integrated unit with integral power supply and audio amplifiers.
   4. Receives and transmits digital signals.

5. Has unique address in the WAVES network, and is individually software controlled from each base station PC.
6. Provides outputs for channels of wideband amplified audio, channels of wideband lin-level audio, one full duplex RS-232 data channel, one analog input, one digital input, and two digital I/O data pins.
7. Provides supervisory built-in self-tests (BIT) that are reported periodically or on demand to the base station where they are displayed and logged.
8. Wold-wide, license-free operation at 2.4GHz.
9. Synchronized audio and visual message output.
10. Auto sensing 100-240V AC.
11. Auto-diagnostics, fully supervised operation.

B. Uninterruptable Power System (UPS-901)
1. for use with the TRX-401 Field Transceiver in WAVES.
2. During normal operation the UPS-901 receives a trickle charge from the associated TRX-401 unit.
3. Balancing circuit is used to maintain an optimal float charge on the battery.
4. Power failure will automatically supply DC power to the transceiver.
5. Automatically transfers power back to the utility power when line voltage returns to normal.
6. Mounts securely to associated TRX via built-in mounting tracks.

C. Universal WAVES Interface UWI-1301-VXR
1. Provides interface from WAVES Mass Notification System to third party vendor systems.
2. Distributes messages through voice capable Fire Alarm Control Panels
3. Provides WAVES transceiver units with one or more contact closure outputs. These outputs are used to interface with other systems and are independently controlled by WAVES.
4. Receives power line-level audio, and responds to serial commands from the host transceiver through its RS-232 port.
5. Simplifies wiring by bundling line-level audio from the transceiver and Push-To-Talk contact closure in a single interface cable 17 feet long.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Splice cable only in accessible junction boxes or at terminal block units.

C. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at amplifier.

D. Install input circuits in separate cables and raceways from output circuits.

E. Provide protection for exposed cables where subject to damage.

F. Support cables above accessible ceilings to keep them from resting on ceiling tiles. Use spring metal clips or plastic cable ties to support cables from structure for ceiling suspension system. Include bridle rings or drive rings.

G. Use suitable cable fittings and connectors.

H. Ground and bond equipment and circuits in accordance with Section 260526.

I. Provide programming of the new transceivers, existing transceivers, and existing base station as required for a fully operational system.

J. Provide posted instructions at FACP for one-way voice communication.

3.2 FIELD QUALITY CONTROL

A. Contractor Field Service:
   1. Provide services of a service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
      a. Include making final wiring connections, inspection and adjustment of complete instillation, and systems demonstration.

B. Measure and record sound power levels at designated locations.

C. Certify that installation is complete and performs according to specified requirements.

3.3 MANUFACTURER'S FIELD SERVICES

A. Provide site survey as required for RF signal strength.

B. Provide the services of manufacturer's technical representative to prepare, start and test the system.

C. Include making final wiring connections, inspection,adjusting, and programming of the completed installation, and systems demonstration.

D. Certify that installation is complete and performs according to specified requirements.

3.4 ADJUSTING

A. Prior to final acceptance, inspect system adjust as required, and replace parts which are found defective.

B. Adjust for appropriate sound levels.

C. Adjust devices and wall plates to be flush and level.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
      a. Briefly describe function, operation, and maintenance of each component.

B. Training: Train Owner's personnel in the procedures involved in operating, maintaining, adjusting, making changes to and preventative maintenance of the system.
   1. Use operation and maintenance manuals as training reference, supplemented with additional training materials as required. At the end of training, Owner's Representative shall be capable of making changes to the system without having to contact manufacturer or manufacturer's representative to make changes to the system.
      a. Train Owner's personnel on programming equipment for starting up and shutting down, troubleshooting, servicing and maintaining equipment.
   2. Provide minimum of one day of training.
      a. For the first year, after the initial Owner's training, provide up to three (3) training sessions for personnel upon the request of the Owner.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site.

3.6 CLEANING AND PROTECTION

A. Prior to final acceptance, clean system components and protect from damage and deterioration.

3.7 TESTING

A. All devices must be tested to verify proper operation. Submit written test results to certify a completed system.

3.8 MAINTENANCE SERVICE

A. Execution Requirements: Furnish service and maintenance of the system components for one year from the Date of Substantial Completion. This shall include all recommended and required preventative maintenance inspections/testing as outlined by the manufacturer and repairs to manufacturer or installer defects. All of this shall be provided at no charge to the Owner. Contractor at the completion of work shall submit to the Owner and Owners Representative a schedule indicating when inspections/testing will be conducted and an outline indicating what inspections/testing will be conducted on the system during the course of the warranty period.

B. All system service calls during the warranty period shall be handled in the following manner:
   1. Owner shall contact the Electrical Contractor and initiate a service call who in turn shall contact the equipment vendor to respond and investigate the source of the service call.
   2. If the equipment vendor establishes that the source of the service call is related to the electrical installation, the equipment vendor shall contact the Electrical Contractor for warranty service.
   3. The Owner shall not be responsible for any charges during the warranty period that result in the Owner notifying the installing contractor of a defect in the system.
   4. During construction and warranty period there shall be a required one hour phone response and a four hour on site response by a qualified technician time limit. All response outside of this service is in breach of contract.

3.9 WARRANTY

A. Call back response time shall be 24 hours 7 days a week.

B. On-site response time shall be 24 hours 7 days a week.

END OF SECTION

SECTION 281300
SECURITY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a complete networked, integrated security system with door hardware, control panels, software, notification appliances, monitoring and control devices, raceway, and circuitry as indicated on the drawings and as specified herein.

B. Related Sections:
   1. Section 087100 - Door Hardware
   2. Section 260519 - Low Voltage Electrical Power Conductors and Cables (600v and Less)

1.2 REFERENCES (MOST CURRENT EDITIONS OF THE FOLLOWING)

A. Building Code of New York State 2007

B. Fire Code of New York State 2007

C. NFPA (National Fire Protection Association) 70 - National Electrical Code

D. NFPA (National Fire Protection Association) 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces

E. ICC/ANSI (International Code Council/American National Standards Institute) A117.1 - Accessible and Usable Buildings and Facilities

F. IEEE (Institute of Electrical and Electronics Engineers) C62.41 - Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

G. UL (Underwriters Laboratories, Inc.) 294 - Standard for Access Control System Units

H. FCIA (Firestop Contractors International Association) - Manual of Practice

I. UL Qualified Contractor Program for Firestop Systems and Spray-Applied Fire Resistive Materials (SFRM's)

1.3 PROJECT SCOPE

A. Provide a complete access control and CCTV systems for Deyo Hall. The system shall be compatible with the existing campus access control and CCTV systems.

1.4 OPERATION

A. Access Control
   1. The campus access control and intrusion detection system is the S2 System, HID proximity card system card readers, and all parts and components shall be compatible with this system. CCTV Surveillance system is a combination of Axis IP network cameras and Milestone Xprotect Corporate NVR.
   2. The campus has a variety of structures with different users, requiring each case to be reviewed for specific functions and user's needs. However, a typical system includes:
   3. Typical access controlled door system includes:
      a. A request to Enter Device - Card Reader (CR).
      b. Requests to exit device (REX)
      c. Electronic Locking Device (EL) with manufactures recommended power supply
      d. Access control panel (ALP) composed of appropriate devices and power supplies. Door control module (DCM)
      e. Door Position Switch (DPS)
   4. An access controlled door system may upon request include:

a. Electronic Power Transfer Device (EPT)
b. Local Audible Device (WEST)
c. An interface with building CCTV surveillance cameras.
d. An interface to building Fire Alarm System.
e. An interface to a door power operator and handicap accessibility.
f. All of the above are linked together electronically, door device cables are gathered in a junction box and run to a central location in the building where they are connected to an access control panel (2500)
g. Access control may be utilized on interior doors as well as exterior doors.
h. System must be compatible with the existing campus access control system.
i. strikes.
j. (REX) or Request to exit device.

B. CCTV
1. Exterior mounted cameras, and interior mounted cameras shall be specified under spec Section 28 2300.
a. Digital CCTV systems shall be applied to provide surveillance of spaces and assets as required.
b. A connection to the college Network Video Solution (NVR).

1.5 SUBMITTALS

A. Submittal Procedures: Submittal procedures as indicated in division 1 of these specifications.

B. Shop Drawings: Indicate non-typical system wiring diagram showing each device and wiring connection. Include exact part numbers of the proposed equipment in the drawings.

C. Calculations: Provide standby battery calculations for all provided power supplies with the designed equipment loads.

D. Product Data: Submit catalog data showing electrical characteristics and connection requirements with the exact part number of the proposed equipment.

E. Test Reports: Indicate procedures and results for specified field testing and inspection.

F. Electrician and Vendor to submit proof of state licensure to install Fire Alarm and Security Systems in New York State.

G. Electrician to submit proof of licensure as Master Licensed Electrician.

H. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.

I. Submit proof of contractor qualifications for installation of firestopping systems.

J. Submit firestopping system and material product data and UL listed firestopping details to be utilized for the project.

1.6 CLOSEOUT SUBMITTALS

A. Execution Requirements: Closeout procedures as indicated in division 1 of these specifications.

B. Project Record Documents: Record actual locations of access control equipment, devices, terminal cabinets, riser conduit runs, and pertinent junction boxes on contract drawings. All project record documents shall be submitted to the Owner's representative for final review prior to the commissioning of the access control system. It is absolutely imperative that record drawings be highly accurate due to the fact that

system labeling is limited to prevent potential tampering due to the system's sensitive nature.

C. Operation and Maintenance Data: Submit manufacturer's standard operating and maintenance instructions for all control panels, pieces of equipment, and peripheral devices to the Owner's Representative prior to the commissioning of the access control system.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Vendor: Licensed installer of security systems with proven experience with the S2 Enterprise and Mercury products that are being installed. The vendor must have an office within 75 miles of the job site that has fully trained service and install technicians available for customer support during and after project completion. Proof of factory training or previous experience with the exact manufacturer products being installed must be submitted.

C. Installer (Electrical Contractor): Licensed installer of fire alarm and security system in New York State. Master licensed electrician with documented experience of the installation of building access control systems.

D. Contractor firestopping qualifications.

1.8 MAINTENANCE SERVICE

A. Execution Requirements: Furnish service and maintenance of the system components for two years from the Date of Substantial Completion. This shall include all recommended and required preventative maintenance inspections/testing as outlined by the manufacturer and repairs to manufacturer or installer defects. All of this shall be provided at no charge to the Owner. Contractor at the completion of work shall submit to the Owner and Owners Representative a schedule indicating when inspections/testing will be conducted and an outline indicating what inspections/testing will be conducted on the system during the course of the warranty period.

B. All system service calls during the warranty period shall be handled in the following manner:

1. Owner shall contact the Electrical Contractor and initiate a service call who in turn shall contact the equipment vendor to respond and investigate the source of the service call.
2. If the equipment vendor establishes that the source of the service call is related to the electrical installation, the equipment vendor shall contact the Electrical Contractor for warranty service.
3. The Owner shall not be responsible for any charges during the warranty period that result in the Owner notifying the installing contractor of a defect in the system.
4. During construction and warranty period there shall be a required one hour phone response and a four hour on site response by a qualified technician time limit. All response outside of this service is in breach of contract.

1.9 MAINTENANCE MATERIALS

A. Provide one (1) controller of each type.

1.10 CONFIDENTIALITY

A. All information regarding security systems shall be considered sensitive/confidential. All system information including submittals, wiring diagrams, programming, reports, etc., shall be handled in an extremely sensitive manner so that the information is not

transmitted to unauthorized persons. Authorized persons shall be considered the owner, owner's representative, installing contractor, and vendor. Installation drawings/diagrams, manuals, or any other information regarding the installation/operation of the system shall not be left unattended in the field at any time. Violations for the mismanagement of system installation information shall be swift and severe up to and including dismissal from the project.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The S2 Enterprise® Security Management System shall be implemented through network appliance architecture with a three-tiered modular hardware hierarchy and embedded three-tier software architecture.
   1. The network appliance shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser.
   2. Browser access for configuration and administration of the system shall be possible from a PC on the same subnet, through routers and gateways from other subnets, and from the Internet. Control and management of the system shall therefore be geographically independent.
   3. Security of the data communicated over the network to and from the browser, Network Controller, and nodes is protected by encryption (SSL 128-bit) or authentication (SHA-1)
   4. The top hardware tier is the Network Controller. Embedded on the Network Controller are an operating system, a web server, security application software, and the database of personnel and system activity.
   5. The middle hardware tier is the Network Node. The Network Node shall make and manage access control decisions with data provided by the Network Controller, and it shall manage the communication between the Network Controller and Application blades connected to the system's inputs, outputs, and readers. This modular design makes it possible, even during network downtime, for the system to continue to manage access control and store system activity logs. When network connectivity is re-established, the system activity logs are automatically re-integrated. The Network Node shall be manufactured by Mercury Security.
   6. The bottom hardware tier is the Application Blades. These application blades shall be manufactured by Mercury Security:
      a. Single Reader Access Control Blade: shall support one reader, two inputs, and two outputs.
      b. Dual Reader Access Control Blade: shall support two readers, eight supervised inputs, and six relay outputs.
      c. Alarm Input Blade: shall support 16 supervised inputs.
      d. Relay output Blade: shall support 16 relay outputs.

B. The S2 system shall integrate, within a browser interface, access control, alarm monitoring, video monitoring, and temperature monitoring applications. These applications shall be embedded in a three-tier software architecture.
   1. The database tier shall use PostgreSQL. PostgreSQL is a full featured, high performance database management system that supports ODBC. This shall provide a small footprint, low administration, and a high reliability relational database that is embedded without requiring the use of a separate PC server.
   2. The web server tier shall be based on an Apache™ embedded web server. This shall provide a graphically rich security management application through a standard web browser.

3. The security application software tier contains the business logic. This application shall also be embedded on the network device and requires no additional memory or processing power.
4. This three tiered embedded software design runs within an embedded Linux Ubuntu operating system and shall require no client-side software other than a web browser.

C. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.

D. All S2 systems and components shall have been thoroughly tested and proven in actual use.

E. All S2 systems and components shall be provided with an explicit manufacturer warranty of one year for software and two years for hardware. The S2 Enterprise® Security Management System shall meet the requirements of business and government access control systems. The system shall monitor and control facility access, and shall perform alarm monitoring, camera and video monitoring, communications loss monitoring, and temperature monitoring. The system shall also maintain a database of system activity, personnel access control information, and system user passwords and user role permissions. The system shall be controlled from a web browser and require no software installation or client licenses. The system shall provide control and access to users on Local Area Networks (LAN), Wide Area Networks (WAN), wireless networks, and the Internet. The system shall provide email and/or text message alerts for all alarm conditions and threats.

F. Widget Desktop: The S2 system shall provide a widget-based user interface that enables users to create custom monitoring layouts by selecting and arranging widgets on a desktop.
1. Each widget shall provide easy access to a frequently used function-allowing users to, for example, view an activity log, a camera view, or real-time web content.
2. System administrators can save custom layouts for subsequent call up by users, who can then arrange the widgets as desired on their desktops. The administrator shall determine which widgets are available in a layout and the extent to which users can customize the layout.
3. When composing layouts, system administrators shall have the ability to display a grid overlay on the Widget Desktop background. Whenever a widget is moved or resized, it will align with (or "snap to") the nearest intersection of lines in the grid. If the grid is saved with the layout, it will appear in the background when users view the layout.
4. The widgets that shall be available for layouts are: Activity Log, Auto-Monitor, Camera View, Clock, Duty Log Entry, Events, Explorer, Floorplans, Intrusion Panel, Passback Grace, PhotoID History, Portal Status, Portal Unlock, Statistics Block, Status, and Threat Level.
5. In addition, when the alarm workflow feature is enabled for the system, an Alarm Workflow widget shall become available for layouts. This widget shall allow operators to monitor and resolve alarms within the alarm workflow implemented for the system.
6. When composing layouts, it shall be possible to display vertical and horizontal red lines in the background to assure that positioning widgets within these lines will fit the screen of an iPad or MacBook Air.

G. System Partitioning: The system administrator shall have the ability to divide the S2 system into partitions, allowing subsets of the overall population and/or resources to be managed separately.

1. From the default Master partition, one or more additional partitions can be created.
2. Each partition shall contain some number of administrators, card holders with their credentials, and resources.
3. When performing administrative functions, the administrator of a partition shall have the ability to affect only the cardholders and resources in that partition. However, resources can be shared across partitions through the mapping of access levels from one partition to another.
4. System partitioning shall have a precision feature that allows administrators in one or more partitions to view and perform edit functions on person records that belong to another partition.
5. Administrators shall have the ability to search for person records across all partitions to which they have access. The system administrator shall have the ability to make such cross-partition searches the default for users who have access to multiple partitions.
6. After finding a person record located in another partition, an administrator shall be able to click a button to switch to that partition directly from the person record-and possibly edit the record, depending on his or her access rights in that partition.

H. The S2 system shall provide the following Access Control capabilities:
1. Login throttling, which can be enabled for the system to limit the number of login attempts from the same IP address in a given period of time.
2. Integrated photo ID creation capability with video verification.
3. User interface secured access under encrypted password control.
4. System-wide timed anti-passback function.
5. Regional anti-passback with mustering and roll call functions.
6. Region occupancy counting and control.
7. "First-in-unlock" rule enforcement.
8. Multiple access levels and cards per person.
9. 128-bit card support for Wiegand card readers.
10. Detailed time specifications.
11. Simultaneous support for multiple card data formats.
12. Lift control.
13. Access privileges variable by threat level.
14. Scheduled portal unlock by time and threat level.
15. Card format decoder quickly discovers unknown card formats.
16. Card enrollment by reader or keyboard.
17. Compatibility with various input devices, including biometric readers.
18. Activation/expiration date/time by person with one minute resolution.
19. Access level disable for immediate lockdown.
20. Use of Threat Levels to alter security system behavior globally.
21. Duress PINs, which can be enabled for the system to allow a valid user to raise an alarm if compelled under duress to use his or her credentials (card and PIN) to allow access for another person.
22. Multiple holiday schedules.
23. Timed unlock schedules.
24. Scheduled actions for arming inputs, activating outputs, and locking and unlocking portals.
25. Optional two-man access restriction for portals, requiring two valid card reads from two separate cardholders for portal entry.
26. Card enrollment reader support.

27. Dual-reader portal support.
28. Wiegand Reader support.
29. Magnetic-stripe reader support with cards using ABA Track 2 format for up to 200 bits.
30. Wiegand keypad PIN support for 4-digit or 6-digit PINs.
31. 8-bit and 4-bit burst keypad support for 4-digit or 6-digit PINs.
32. Integration with supported alarm panels.
33. DMP intrusion panel high-level TCP/IP integration.
34. Optional storage and recall of ID photos and personal/emergency data.
35. Up to 150,000 person records.
36. Up to 20,000 credentials are stored locally. An unlimited number of credentials may be authenticated with the controller, caching the most frequently used credentials on the node.
37. Unlimited number of scheduled actions, with the controller downloading up to of 16 per node per day of the soonest-to-activate actions applying to that node, and any others remaining in the database as candidates for downloading later. Expired scheduled actions are removed automatically.
38. The system shall support tracing a person's activity in the current partition if the "Trace this person" check box is selected on the person record.

I. The S2 system shall provide the following Monitoring capabilities:
1. The Home page, which is available from the Monitor : Live Monitoring menu on Extreme, lets users view a full system summary, including the Activity Log, Auto-Monitor, and links to frequent User Tasks.
2. Common alarm panel integration for disarm on access, and arm on egress.
3. Support for the direct viewing of IP cameras.
4. Integrated real-time IP-based DVR and NVR systems with stored video replay for events.
5. Provides alarms on video loss, video motion detection, and video restore events.
6. Virtual inputs for video loss and building-occupancy-limits-exceeded.
7. Provides alarms on communication loss and temperature variation.
8. Support for the creation of custom sets of alarm event actions.
9. Provides the ability to record video and link to video for alarm events.
10. Available video control and playback through the S2 System user interface.
11. Provides the ability to assign threat levels to various alarms according to severity.
12. Provides the ability to select up to 20 levels of priority for event actions.
13. Provides the ability to enter a duty log comment into the Activity Log, or to append a unique or preset comment to a particular log entry while viewing the Activity Log.
14. Support for the display of Activity Log entries that include both the time the event occurred on the node and the time it was reported to the controller.
15. Support for electronic supervision of alarm inputs.
16. Support for the use of output relays for enabling circuits under alarm event control.
17. A monitoring desktop that integrates video, system activity logs, floorplans, ID photos, and alarm notifications.
18. Support for the creation of unlimited customized monitoring layouts through the use of widgets, including layouts sized for the iPad or MacBook Air.
19. Graphic floorplans with active icons of security system resources.
20. System user permissions to grant whole or partial access to system resources, commands, and personal data.
21. Secure access to the user interface under encrypted password control.
22. Delivery of alerts via browsers, email, and text messages.

J. The S2 system shall provide the following Video Management capabilities:
   1. Real-time video monitoring displays, including unlimited cameras simultaneously.
   2. Playback of event-related video.
   3. Video switching and video widget pop-ups based on access activity or event activation.
   4. Integrated alarm inputs from the video management system.
   5. Digital playback of video events.
   6. Linking of video and events based on triggers provided by the S2 system or video system.
   7. Support for multiple DVR and NVR systems.
      a. Up to 64 subordinate NetVRs and up to 1024 cameras with an Enterprise Select system
      b. Unlimited for subordinate NetVRs and cameras with an Enterprise Ultra 2 system
   8. Multiple pre-programmed supported cameras.
   9. Recall of photo ID and real-time image for comparison.
   10. Monitoring and control through a web browser interface.
   11. System user permissions to grant whole or partial access to system cameras and video resources.

K. The S2 system shall provide the following Security Database capabilities:
   1. Maintain data of system activity, personnel access control information, system user passwords and custom user role permissions for whole or partial access to system resources and data.
   2. Partitions: It shall be possible to partition the system to create independent, virtual security management systems for multiple populations.
   3. Support for the sharing of access levels and user privileges across partitions in a system.
   4. Built-in Open Database Connectivity (ODBC) compliant database for personal data.
   5. LDAP integration for single-user login authentication.
   6. Unlimited person records.
   7. Network-secure API for external application integration.
   8. Extensive and easy to use custom report generator.
   9. User-defined data fields in personnel records.
   10. Record recall by vehicle tag, name, or card.
   11. ODBC compliant Database.
   12. An API for adding to, deleting from, and modifying the database.
   13. Storage of system user passwords and permissions.
   14. Storage and recall of ID photos and emergency personal information.
   15. Pre-defined reports on system configuration, system activity history, and people.
   16. An Audit Trail report that shows changes made to the security database over a specified period of time.
      a. For each transaction listed in the report results, information is available on when the transaction occurred, who made the changes, the fields that were modified, and the original and new values.
      b. Search criteria can be applied to filter the report results, either by the person whose record was changed or by the area of the system configuration that was modified.

17. A Credential Audit report that shows all existing access cards by their current status settings. The report also shows for each card the name of the person to whom it was issued and the card number.
18. A Duty Log report shows duty log comments residing in the current security database, including archives.
    a. For each duty log comment included in the report results, information is available on when the comment was entered, who entered it, the date and time of the logged event associated with the comment, the name of the logged event, and the specific comment text.
    b. Search criteria can be applied to filter the report results, either by Operator (the user who entered the duty log comment) or by Event type.
19. English-based query language for instant custom reports.
20. Custom report writer interface that allows the interactive creation of custom reports. Reports may be saved for later reuse. No third party software (such as Crystal Reports) shall be necessary.
21. Periodic backup to on-board flash ROM and optional network attached storage (NAS), including FTP servers.
22. Periodic archive creation for historical custom reporting and improved on-board database performance.
23. Email and text messaging (SMS) alert notifications.

L. The system shall support the integration of access control hardware from Mercury Security Corp.

M. The following Mercury hardware components shall work with the S2 Controller:
1. Supported Mercury Panels:
    a. EP2500: Intelligent Controller: 32 MB RAM, Ethernet
    b. EP1502: Intelligent Dual Reader Controller: 16 MB RAM, Ethernet, 2 readers (magnetic stripe or Wiegand) 8 inputs, 4 relays
    c. EP1501: Intelligent Single Door Controller: PoE, single door, 2 readers, 2 inputs, 2 outputs
    d. Mercury firmware version 1.14.8 is supported on the above panels.
2. Supported Mercury Interface Boards (SIOs):
    a. MR-50 Reader Interface Module: 1 reader (magnetic stripe or Wiegand), 2 inputs, 2 relays
    b. MR-52 Reader Interface Module: 2 readers (magnetic stripe or Wiegand), 8 inputs, 6 relays
    c. MR-16in Input Monitor Module: 16 inputs (zones), 2 relays
    d. MR-16out: Relay Output Control Module: 16 relays

2.2 SYSTEM SOFTWARE

A. Operating System and Application Software:
1. The embedded operating system for the solid-state S2 Network Controller shall be the Linux Ubuntu operating system. The S2 Enterprise Select and S2 Enterprise Ultra 2 Network Controllers shall use Linux Ubuntu 10.04 LTS (long term support) as the operating platform. The operating system kernel shall be open-source and no operating system training or certification shall be necessary.
2. The S2 system application software shall be embedded in the system. The database shall be an embedded PostgreSQL relational database requiring a small footprint and provides high reliability. The web server shall be based on an embedded Apache™ web server enabling users to access and operate the system using a standard web browser.

B. S2 Software Licensing:

1. Software licensing shall be based upon the number of readers, cameras, and select features for one Network Controller. Software license upgrades shall be available if system reader and camera capacity must be raised. The S2 user license shall be valid in perpetuity and shall include one year of software updates from the date of shipment from the factory.
2. Licensing shall be controlled by a Product Key and an Activation Key. The Product Key contains the licensed system features and limits. To upgrade your system license to enable more cameras or more doors you will need a new Product Key. The Activation Key contains the warranty expiration date. The keys are locked to the system license number. The system license number shall be viewable on-screen on the Support : About page

C. S2 Software Upgrades: Software upgrades shall be possible from a browser on any network-connected PC, by uploading a software update to the Controller. Controllers shall automatically upgrade all connected nodes. No client software installation shall be necessary.

D. Online Help and Documentation: The S2 system shall be provided with complete embedded documentation. The online documentation shall include:
1. Context-sensitive online Help. (The Help displayed is specifically relevant to the current screen.) The online Help system shall provide explanations and procedures for all monitoring, administrative, and system configuration and maintenance functions. The Help system shall have linked table of contents, a linked index, and frequently asked questions pages. Each topic shall also have links to related topics. Each Help topic shall be printable.
2. Technical Support Notes: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
3. Installation Guides: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
4. Video Integration Guides: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
5. End-User Task Guide: This document shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics

E. S2 Support Collaboration: It shall be possible, by the use of a network Support Collaboration Tool, for a technical support specialist to connect to the S2 system and assist on-site technicians from remote network-connected locations. It shall only be possible for an on-site system administrator or technician to initiate this connection. There shall be no way to initiate this connection from outside the secure network.

F. Floorplans: The S2 system shall provide graphic floorplan capability including graphic display of links to other floorplans, alarms, system resources such as portals, IP video cameras, inputs, outputs, and temperature monitoring points.
1. The Network Administrator holding at least a "Setup" user role shall be able to graphically configure device icons onto the floorplan images, and to upload additional floorplan images. JPEG images shall be supported, and the maximum size for a floorplan image shall be 256K.
2. It shall be possible to create floorplan groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a floorplan group is assigned to a particular system user then the floorplans in that group shall be viewable by that system user.

G. Personnel Data: The S2 system shall maintain person data relating to access control, system user privileges, photo identification, system activity, and contact information.
   1. All person data in the system shall be integrated onto one tabbed page for viewing, editing, and deletion by system users.
   2. A system user holding at least an "Administer" user role shall be able to create, delete, and modify person records, including access levels.
   3. A system user holding at least a "Setup" user role shall be able to configure the display of person records. For example, the user shall be able to hide various tabs, and configure the User-defined tab by changing the tab label and customizing any of the 20 data fields that appear on the tab. The user shall also be able to define UDF value lists, which can be displayed as pre-entered drop-down lists for user-defined data fields.

H. Data Import and Export: A Data Management Tool shall be provided that supports, via an API, the import and export of personnel data. This tool shall make possible the pre-populating, and ongoing populating, of cardholders into the S2 system database.

I. Data Security:
   1. Communication between the S2 Network Controller and the browser shall be secured using SSL. In addition, administrative access to the security management application and the personnel data shall be password protected and controlled by roles-based authorizations.
   2. Communication between the S2 Network Controller and the S2 Network Nodes shall be encrypted and authentication/tamper detection shall be done using the SHA-1 algorithm.
   3. Communication between the S2 Network Controller and other systems (when using the API) shall be secured using SSL and authentication/tamper detection shall be done using the SHA-1 algorithm.

J. Data Backups: It shall be possible to configure regular automatic database backups.
   1. It shall be possible to back up a solid-state Extreme Network Controller to a built-in solid state hard drive.
   2. It shall be possible to back up an Enterprise Select Network Controller and Enterprise Ultra 2 Network Controller to a built-in solid state hard drive.
   3. It shall be possible to save backups from any controller to separate network attached storage (NAS) and file transfer protocol (FTP) servers.
   4. It shall also be possible to setup regular automatic creation of database archive files.

K. On-board Data Management: Each night the S2 system shall truncate a sufficient number of the oldest records held on-board to reduce the database to its set limit, if required. This shall create the needed storage space for additional system activity records. Truncation will be performed on a First-in, First-out (FIFO) basis.

L. Partitions: It shall be possible to create multiple partitions for the management of multiple security systems or multiple populations.
   1. It shall be possible to limit access to the data and resources of one partition to those with permissions for that partition.
   2. It shall be possible for each partition to have its own population, resources, rules, events, video management, log data, reports and network resources.
   3. It shall be possible to grant Monitor, Administer, and Setup privileges for multiple partitions to the same user. It shall also be possible to create custom user roles for each partition.
   4. A node can reside in only one partition. It shall be possible to create partitions without nodes.

M. User Roles and Permissions: There shall be four pre-programmed levels of User Roles, and a total of 16 possible Custom User Roles that can be configured in the system with different permissions for each user:
    1. Master Partition Monitor: These users may use the functions in the Monitor menu only within the Master (default) partition. Monitor functions shall include viewing the activity log, cameras, and floorplans.
    2. Master Partition Administer: These users may use the functions of both the Administration and Monitor menus only within the Master (default) partition. Administrative functions shall include adding and editing person information in the enrollment database, issuing and revoking cards, generating reports, and performing database backups.
    3. Master Partition Setup: These users may use the functions of the Setup, Administration, and Monitor menus only within the Master (default) partition. Setup functions shall include defining access control, alarm event behavior, camera settings, floorplan images and configurations, holiday and time specifications. Setup functions shall also include: designation of network resources such as time and DNS servers, email and network storage settings; performance of system maintenance such as database backup and restore, software updates and file cleanups; designation of time zone, daily backup schedule and enrollment readers.
    4. Full System Setup: These users may use the functions of all menus in all partitions.
    5. Custom User Roles: In addition to the roles above the system shall also support the creation of detailed user permissions regarding which cameras, floorplans, elevators, events, access levels, portals, reports, and personal data fields the system user may see, edit, delete, or control.

N. Alarm Panels: The S2 system shall be capable of integrating with alarm panels, arming the panels, disarming the panels, and triggering events based upon alarm panel status.

O. DMP Intrusion Panels: The S2 system shall be capable of integrating with Digital Monitoring Products (DMP) XR500 Command Processor Panels.
    1. Security administrators can use events on a DMP panel, such as a zone going into an alarm state, to trigger events in the S2 system. They can also use events in the S2 system to control operations on the DMP panel, such as the arming or disarming of an area.
    2. Monitors can use the Intrusion Panel widget to view configuration and status information for a DMP panel. They can also arm and disarm areas, bypass and reset zones, and activate and deactivate outputs associated with the panel.

P. Alarm Events: The S2 system shall be capable of managing alarm events.
    1. It shall be possible to delay an input's change to the Alarm state by a specified number of seconds. The range of delay options shall be .5 seconds or 1-120 seconds.
    2. It shall be possible to associate specific actions with each alarm event. These actions may include, but are not limited to:
        a. Lock and Unlock portals.
        b. Activate and Deactivate relay outputs.
        c. Arm and Disarm input groups.
        d. Pulse outputs or output groups.
        e. Arm and Disarm alarm panels.
        f. Send emails and SMS messages.
        g. Move cameras to preset positions.
        h. Switch to a video monitor.

i. Record video.
j. Momentarily unlock portals.
k. Display ID photos.
l. Change the threat level for a location, and (optionally) for its sub-locations.
m. Make entries in the activity log.
n. Play a digital sound file; it shall be possible to specify that it play in a loop until cleared or acknowledged.
o. Display alarms in different colors.
p. Set a priority for an alarm (one of 20 levels, with 1 being the highest).
q. Require a duty log entry.
r. Clear alarm automatically or require an acknowledgement.

3. A system user holding at least a "Setup" user role shall be able to create, delete, and modify alarm system inputs, input groups, outputs, output groups, alarm panels, and events.
4. It shall be possible to trigger events based on system activity such as:
   a. Failed login attempts.
   b. Video motion detection.
   c. Camera failure and camera restore events.
   d. Valid or Invalid card reads.
   e. Portals held or forced open.
   f. Valid card reads with a specified access level.
   g. Inputs entering an alarm state.
   h. High and low temperature events.
   i. Alarm panel arming failures.
   j. Alarm panel zone faults.
   k. Tailgating and passback violations.
   l. Occupancy limit violations.
   m. Zone empty violations.
   n. Node power failure, communication failure, timeout, and tamper events.
5. It shall be possible to clone an event which creates an event with all attributes of the original, needing to change only the event's name and any attributes it will not have in common.

Q. Activity Monitoring:
1. The S2 system shall support a Monitoring Desktop that integrates video, system activity logs, floorplans, ID photos, and alarm notifications.
2. Activity Log viewing includes one-click navigation to person records.
3. The system shall support a Widget Desktop that allows the creation of custom monitoring layouts. Within a custom layout, widgets display live video, system activity logs, alarm notifications, ID photos, floorplans, duty log entries, portal status displays, and DMP intrusion panels.
4. Many widgets support multiple partition viewing and filtering. For example, the Activity Log widget can display data from multiple partitions and data filtered by event type or reader group, and/or based on the text content of the event.
5. It shall also be possible to view cameras, activity logs, and floorplans on separate monitoring pages within the application.
6. The system shall support tracing a person's activity in the current partition if the "Trace this person" check box is selected on the person record. The traced activity is displayed in bold in the color selected for "Trace person log color" on the Network Controller page. In addition, if an event is selected for "Trace person event" on the Network Controller page, it is triggered each time a traced person

makes an access attempt. These event activations can be reported using a Trace people filter in a custom history report.

R. Network-based Camera and Video Surveillance: The system shall provide live IP video surveillance capability. The number of supported cameras shall be limited only by license. The system's video capabilities shall include video monitor switching based on access activity. The system shall provide monitoring, configuration, and administration of IP video. Cameras can be separately monitored or monitored in groups.
   1. CCTV Building Surveillance shall be Axis Communications cameras & Milestone Xprotect Corporate NVR software.
   2. For IP cameras for existing campus Milestone Xprotect Corporate NVR installation plus 1 year of SUP and care premium per camera.
   3. Interior cameras to be Axis Communications. Refer to specification section 282300 for additional information.
   4. All electronic equipment shall be installed on equipment racks. Refer to specification section 271009 Part 2.07.B for rack specifications.
   5. Cameras by Axis Communications.

S. The consultant/vendor shall coordinate all security system design and installation with Facilities, Campus Telecom and all on site affected building trades (Finish Hardware, Electrical, etc.) for areas of responsibility and execution of related work.

T. Access Control:
   1. The S2 system shall be able to make access control decisions, define a variety of access levels and time specifications, write system activity into a log file, maintain a personnel enrollment database, receive signals from input devices such as door switch monitors, card readers and motion detectors, energize devices such as door locks and alarms via outputs.
   2. Time Specifications: The system shall be capable of storing up to 512 time specifications. Each time specification must be assigned a unique alphanumeric name of up to 64 characters. The definition of a time specification shall require the assignment of both a start time and an end time. Each day of the week shall be individually assignable for inclusion in time specifications. Up to three holiday groups shall be assignable for inclusion in time specifications. If no holidays are assigned to a time specification then no holiday access shall be allowed.
      a. Time specifications shall be assignable to access levels, output groups, portal groups, input groups, and alarm events.
      b. Time specifications shall function appropriately per node for the time zone specified for that node.
   3. Card Formats: The system shall support the use of readers that use the Wiegand Reader Interface. The system shall default to the Wiegand 26 bit format unless a different bit length format is created in the system. The system shall support but not require the use of the card facility code. The system shall also support the use of the Magnetic Stripe ABA track 2 card data formats.
      a. It shall be possible to create new card formats, designate start bits and bit lengths for facility codes and card ID numbers, as well as designate parity bits. The system shall support up to 32 different card formats. The system shall support card formats up to 128 bits.
      b. It shall be possible to reverse the read order of the bits in the facility code and/or card ID portions of a card format.
      c. It shall be possible to view and change the default parity bit definitions for a card format.
      d. The system shall support the use of the FIPS 201 (Federal Information Processing Standard Publication 201) 75 bit card format.

e. Administrators shall be able to specify a specific number of days of non-use that will be allowed before unused cards will be disabled. Administrators shall be able to exempt individual users from this non-use rule.

4. Access Levels: The system shall be capable of storing up to 512 access levels in each partition.
   a. Each access level must be assigned a unique alphanumeric name of up to 64 characters.
   b. The definition of an access level shall require the assignment of a reader or reader group, and a time specification.
   c. It shall be possible to also assign an elevator floor group to an access level.
   d. It shall be possible to create a temporary access level by assigning an activation date and/or expiration date for any of a person's assigned access levels. It shall also be possible to have the system automatically remove a temporary access level once it has expired.
5. First-in Unlock Rule: The system shall support the use of a First-in unlock rule. It shall be possible to use this rule to control the unlock behavior of portal groups with assigned unlock time specs.
   a. The First-in unlock rule shall require a card read of a specified access level. The portals in the group shall unlock only when the rule is satisfied and the unlock time spec is valid.
   b. There can be up to 64 First-in unlock rules in the system at a time.
6. Double Card Presentation: The system shall support the use of a Double Card Presentation mode. This mode shall allow the presentation of a card twice in quick succession at a designated reader. Such a "double read" shall change the locked portal to an unlocked state until a subsequent relock event or user-designated timeout occurs. The double card presentation mode shall be enabled on an individual portal basis and shall also require a designation on the access level assigned to the cardholder. The mode shall adhere to time spec and threat level restrictions.
7. Keypad timed unlock: It shall be possible to enable a timed unlock feature for a portal that has a combination reader/keypad device. Once this feature is enabled, any cardholder with valid access to the portal shall be able to specify how long the portal will remain unlocked.
   a. A cardholder presents his or her card and then enters the associated PIN, followed by the number sign (#) and the number of minutes (1-99) the portal should remain unlocked.
   b. The portal will remain unlocked for the specified number of minutes, unless it is closed before the timer expires. If the portal remains open after the timer has expired, a [Door Held Open] alarm will be activated.
   c. If reader/keypad devices are located on both sides of the portal, cardholders will be able to use either device to initiate a timed unlock.
8. Holidays: The system shall be capable of storing up to 30 holidays per partition. Each holiday must be assigned a unique alphanumeric name of up to 64 characters. The definition of a holiday shall require a start date and an end date. Holidays shall have the ability to span several days using only one holiday slot. Holiday definitions shall support the designation of a start time and an end time. If no start time is designated then the system shall default to 00:00 (start-of-day). If no end time is designated then the system shall default to 24:00 (end-of-day). Holidays shall require the use of 24-hour time format, e.g. 17:00 is 5:00PM.
9. Portals: A portal is any access point and each portal supports up to two access reader devices. The System User, holding at least a "Setup" user role, shall be able to view current portal definitions, change portal definitions, delete portals, and

create new portals. Creating a portal defines the access and alarm behavior of the access point. This can include:
    a. Card readers and keypads.
    b. Output for locking.
    c. Input for monitoring the door switch.
    d. Input for a Request-to-Exit function.
    e. Local alarm outputs and system alarm events.
10. Portal Groups: It shall be possible to create groups of portals and to assign an unlock time specification to the entire group. All the portals in the group shall remain unlocked during the time specified.
    a. It shall be possible to use portal groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a portal group is assigned to a particular system user then the portals in that group shall be viewable and unlockable by that system user.
11. Portal Alarm Conditions: Portals shall have four alarm conditions. The four alarm conditions are as follows:
    a. Forced: When a portal is opened and there has been no card read, nor request to exit.
    b. Held: When a portal is held open past the expiration of the shunt timer.
    c. Invalid: When the portal reader reads a card for which there is no entry in the database.
    d. Valid: When the portal reader reads a card for which there is a valid entry in the database.
12. Two-man entry restriction: It shall be possible to require two valid card reads by different cardholders within a specified number of seconds for entry to a specific portal.
13. Anti-passback: The system shall support both regional and timed anti-passback access control. For anti-passback functions, it shall be possible to configure regions, assign readers to those regions, and specify events for response to tailgate, passback, and occupancy limit violations. It shall also be possible to designate parent regions for hierarchical anti-passback.
    a. Grace: It shall be possible for a system Monitor or Administrator to Grace card holders from passback and tailgate violations.
    b. It shall also be possible to set a specific time for all cardholders to be Graced daily.
    c. The system shall be able to automatically place the cardholder in a predefined region upon the selection of the grace option
14. Mustering: To aid in evacuation management it shall be possible to designate a region or regions for mustering. It shall be possible to quickly get an occupancy count and occupant list for any region.
15. Scheduled Actions: It shall be possible to specify system actions to occur at scheduled times. When scheduling an action, it shall be possible to specify whether the time specifications for the scheduled action will be based on the time zone set for the local Network Node or the time zone set for the Network Controller. Scheduled actions can include:
    a. Arming and disarming inputs.
    b. Activating and deactivating outputs.
    c. Locking and unlocking portals.
16. Floorplans: The system shall be capable of displaying active graphic floorplans and configuring each floorplan with icons representing system resources: cameras,

portals, temperature points, and alarms. A network administrator holding at least a "Setup" user role shall be able to upload floorplan images and graphically configure device icons onto the floorplan images. Viewing floorplans will require the Macromedia Flash Player 9.0 plug-in for the browser.

a. It shall be possible to create floorplan groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a floorplan group is assigned to a particular system user then the floorplans in that group shall be viewable by that system user.

17. Lift Control: The system shall be capable of controlling lift access to lounge.

U. Threat Levels:
1. It shall be possible to configure up to eight threat levels. It shall be possible to alter security system behavior through the use of threat levels. Groups of threat levels may be created and assigned to portal groups, access levels, input groups, output groups, floor groups, and event actions. The behavior of groups, access levels, and event actions with assigned threat level groups shall change based upon the current system threat level.
2. The S2 system shall support 32 threat level groups.
3. It shall also be possible to change the system threat level in response to an alarm event.
4. The current system threat level shall display in the title bar of the security application interface and on floorplans.

V. Location-based threat levels: The system administrator shall have the ability to define locations. This allows for threat levels to be assigned to individual locations.
1. Within each parent location, sub-locations can be created, and additional sub-locations can be created within each of these, and so on. This creates a location hierarchy.
2. Portals can be assigned, and threat levels applied, to any location within the hierarchy.

W. Appropriate Use banner: The system administrator shall have the ability to enter text (such as an appropriate use statement) to be displayed on the login page.

X. Reports:
1. The S2 system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system. In addition, an easy to use query language shall be included to create ad hoc reports. The query language shall be documented in the online help system. Alternatively, it shall be possible to specify a query by use of point-and-click.
2. It shall also be possible to produce reports directly from the Network Controller based on data in archive files on FTP servers, network attached storage, or the built-in hard drive.
3. The S2 system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.
4. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.
5. Report generation shall not affect the real-time operation of the system.
6. The specific reports provided shall include the following:

a. Configuration Reports
    1) As Built: A graphical report that displays an image of each Application blade in a node and the specific resources (inputs, outputs, readers, etc.) configured for that blade. The network settings for the node shall also be included.
    2) Cameras: Displays all camera configuration information including control address, IP port, and camera type.
    3) Camera Presets: Displays configured presets for each camera in the system.
    4) Elevators: Displays elevator configuration information including Node, Reader, and Floor to output mappings.
    5) Floor Groups: Displays all configured floor groups for use in elevator control.
    6) Holidays: Displays holiday specification information.
    7) Portals: Displays portal definition information including reader, DSM input, REX input, alarm outputs, and events.
    8) Portal Groups: Displays a list of all defined portal groups.
    9) Reader Groups: Displays defined groups of readers.
    10) Remote Locksets: Available if the Remote Locksets feature is licensed for the system. Displays the following information for each remote lockset: name, IP address, synchronization status, serial number, last completed update time, firmware version, battery voltage, assigned remote lockset profile, and number of stored cardholders. The report can be sorted by any of the columns.
    11) Resources: Displays all configured system resources including readers, inputs, outputs, elevators, and temperature points.
    12) Threat Level Groups: Displays all configured threat level groups and the threat levels assigned to them.
    13) Threat Levels: Displays all configured threat levels including the description and color assignment.
b. History Reports
    1) Access History: Displays access history based on an entered query. The system user can specify the query using either the keyboard or point-and-click selection.
    2) Custom Report: This provides the capability to create custom reports of historical data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.
    3) General Event History: Displays time, type of activity, and activity details for a variety of event types. The system user can select the specific event types for the report.
    4) Portal Access Count: Display how many times users have used a portal.
    5) Audit Trail: Displays an audit trail of system changes and the name of the system user that made the changes. It shall be possible to specify the dates and times covered in the report.
    6) Duty Log: Displays duty log comments residing in the current security database, including archives. For each duty log comment, the report shows the date and time the comment was entered, the person who entered the comment, the date and time of the logged event associated with the comment, and the Activity Log message followed by the specific comment text.

c. People Reports
    1) Access Levels: Displays all access levels entered into the system including time specification, reader/reader group, and floor group.
    2) Credential Audit: Lists existing credentials by their current status settings (such as Active, Damaged, Lost, or Not Used). Before running the report, users can filter the data to see only credentials with a particular status setting, or only credentials that were not used with a specific number of days from the date they were issued.
    3) Current Users: Displays a list of all security system users currently logged in to the security system website.
    4) Custom Report: This provides the capability to create custom reports of personnel data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet
    5) Occupancy: Displays a list of defined regions with the number of people currently occupying each region and the maximum number of occupants allowed, if a maximum has been specified.
    6) Photo ID Gallery: Displays all the photo ID pictures in the system and the person's name.
    7) Photo ID Requests: Displays all outstanding badge print requests and lists ID, name, badge layout, activation date, request date.
    8) Portal Access: Lists people with access for a selected portal.
    9) Roll Call: Allows you to select a defined Region from the drop-down and see a list of people currently in that region.
    10) Roster: Displays every person entered into the system and it lists name, ID photo, expiration date, username, and access level.
    11) Time Specifications: Displays all defined time specifications currently in the system.

Y. Administration: The S2 system shall provide for the performance of system administration tasks from any network-connected computer with a browser. Most of the administrative, maintenance, and configuration utilities and functions shall require a S2 system user with at least a "Setup" user role. Information from the network administrator shall, in many cases, also be required. These administrative tasks shall include but not be limited to:
    1. Generating reports:
        a. The system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.
        b. Alternatively, the system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a pdf file or put into a spreadsheet.
        c. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.
        d. A system user holding "Administrator" permissions shall be able to view and create reports.
    2. Database backups:

a. The system shall create database, or full system data backups, each night at 00:15 hours. These backups shall be stored in ROM and written to the drive on the disk-based controller.
b. Backups shall also be written to network attached storage (NAS) or an FTP server if such storage has been configured in the system.
c. It shall also be possible for the system users to create such database backups at any time. Any database backups onboard the Network Controller may also be downloaded to off controller storage by the system user at any time.

3. System restore:
   a. The system shall be able to restore its database, or the full system data, from a backup. Restoration of the system shall only be possible from a backup copy onboard the Network Controller. It shall, therefore, be possible to upload a copy of a database backup from any network attached storage.
   b. It shall be possible to review backups by date and description and select the desired backup for upload to the Network Controller or restoration as the current system database.
4. Software updates:
   a. Software updates, upgrades and patches shall be provided from time to time. The system shall be able to update its software from these .tgz files. Update of the application software shall only be possible from an update file onboard the Network Controller. It shall, therefore, be possible to upload a copy of the software update from any network attached storage or from any PC drive or desktop.
   b. Software updates may involve the Network Controller only or may include updates for the node(s) also. The monitoring of the security system may be unavailable for several minutes during this process.
5. File cleanup: A utility shall be provided to assist in file cleanup. This utility will display for review and deletion all floorplan jpeg files, photo IDs, database backups, badge layouts, and software updates.
6. File upload: The system shall support uploads of files for use in and with the system. Files which shall be uploadable include:
   a. Floorplans in jpg format
   b. Badge layouts
   c. ID photos in jpg format
   d. Database backups
   e. Software license files
   f. software updates
   g. Threat level icons in jpg format
   h. Sound files (.wav) for use in event alerts
7. Setting system time, time zones, and time servers:
   a. The system shall support the setting of time zones by selection off of a drop down pick list. Time zones shall be separately settable for the controller and for each node or MicroNode in the system. An extensive list of world-wide time zones shall be provided. Adjustments for daylight saving time (summer time) shall be automatic.
   b. The system shall support the use of network time servers. Up to three time servers can be designated. Use of a network time server ensures that the Network Controller and its nodes will be regularly synchronized with the exact time used by all other network resources.
   c. It shall also be possible to manually set the system date and time.
8. Changing passwords:

a. Person data maintained in the system may also contain a user name and password for logging on to the security application website as a system user. The system shall support the changing of administrator passwords. It shall be required to enter the password twice for verification purposes.
b. Administrators shall be able to specify a minimum number of characters that users must include in their login passwords.
c. Administrators shall be able to specify that users' login passwords must contain a combination of letters, numbers, and special characters.
d. Administrators shall be able to set a password expiration period in months (from 1 month to 12 months) for all passwords in the current partition. Whenever a user changes his or her password, it will remain in effect for the selected number of months.
e. It shall also be possible to integrate an LDAP server for single-user logon authentication. This will reference the LDAP-stored password for use by the system.

9. Issuing and revoking cards (credentials):
   a. Access cards shall be assignable by the system user either by entering card data directly into the person record or by use of an enrollment reader. Access levels shall be assignable through the user interface by selection from a drop-down list.
   b. Access cards shall be revocable at any time. A system user holding at least the Administer user role may perform this action. Revoked cards shall stop functioning immediately.
   c. A system user holding at least the Administrator role may also disable an access card by changing its Active status to Clear, Damaged, Disabled, Forgotten, Lost, Not Returned, Not Validated, Returned, Stolen, or Suspended. The card will not function with any of these status settings (unless the setting has been customized, as described below). Running a Credential Audit report shall allow existing cards to be viewed by their current status settings.
   d. A system user holding at least the Administrator role may customize any of the following access card status settings: Clear, Damaged, Forgotten, Lost, Not Returned, Not Validated, Returned, Stolen, or Suspended. The user can change the name and/or description of the status setting, and can specify that a card to which the setting is applied will continue to function.
   e. A maximum number of active cards per person can be enabled for the system. Once a person has reached the system limit, a new card can be added for that person only if one of his or her active cards is revoked or disabled.
   f. When "Enable credential profiles" is selected on the Network Controller page, it shall be possible to assign credential profiles to individual credentials to determine the number of days of non-use before they expire.
   g. It shall be possible to set expiration dates for individual credentials in a person record.
   h. It shall be possible to specify that any credential not used within a specific number of days from the date it was issued will be disabled automatically.
10. Enrolling new people: All person data entered into the system shall be held in the system database and shall be available only to system users holding at least the Administer user role. Person data can be added, deleted, and edited by such system users.
11. Creating Photo IDs: The system shall include an integrated photo ID function. It shall be possible:
    a. To design badge layouts.

b. To upload badge layouts for badge printing.
c. To capture ID photo images, print badges, and delete uploaded badge layouts.
d. For the system user to manage all photo ID functions entirely from within the browser.
e. To track the number of times a badge has been printed.
f. To print multiple badges at once using the Badge Print Workflow.
g. To enroll a person's card number manually or through a reader and save the new credential from the Badge Print Workflow.

12. Configuring network resources:
    a. DNS: The system shall support setting IP addresses for up to two domain name servers.
    b. Email settings: The system shall support the use of email notifications of alarm events. The system user must setup the email server IP address or DNS name and the email address of the Network Controller. A network administrator must setup the network mail server to relay email for the IP address of the Network Controller.
    c. File transfer protocol (FTP): The system shall support the use of an FTP Server for backups. Once configured, backups are automatically saved to the FTP server each night.
    d. NAS: The system shall support the use of network attached storage devices for backups. The network administrator must create a domain user account for the Network Controller and a password. The system user must configure the network attached storage in the system including the domain name, server IP address, share name, and the directory where the Network Controller may store data.
    e. Time Servers: The system shall support the use of network time servers. Up to three time servers can be designated. Use of a network time server ensures that the Network Controller and its nodes will be regularly synchronized with the exact time used by all other network resources.
    f. A system user holding “Setup” permissions shall be able to configure network resources.
13. LDAP: It shall be possible to configure an Active Directory Server with the S2 system.
    a. This shall provide single user-login capability.
    b. Password rules and authentication will be governed by the LDAP server.

2.3 ACCESS CONTROL NETWORK DOOR CONTROLLERS

A. Provide a System Control Processor as shown on the project plans. The Processor shall provide access control processing, host functionality and have a capacity for two doors, including reader, lock, and door status and request-to-exit device.
    1. The processor shall be capable of several communication options including: serial , dial-up or TCP/IP. It shall communicate with the server via TCP/IP and to peripherals via serial RS-485 protocol.
    2. The processor shall have a 6MB memory configuration to allow a card storage capacity of 600,000 cards and to buffer a minimum of 50,000 events.
    3. The processor shall have the capability of a total of 64 access control points via RS485 through expansion boards.
    4. The door controller shall accept Wiegand output card readers and card formats up to 128 bits in length.
    5. The Controller shall have the following functionality:
        a. Primary Port: 10/100 Ethernet Port
        b. Secondary Port: RS-485, RS-232, and Dial-UP.

c. Two dedicated inputs: tamper and power monitor.
d. Up to 8 active card formats per intelligent controller.

6. Manufacturer and Model: Based on system design and approval by SUNY New Paltz Telecommunications Representative Mercury EP-2500, EP1502, or S2 Netbox.

B. Provide a door controller(s) as shown on the project riser and plans. The door controller shall provide access control processing, host functionality and power for a single door, including reader, lock, door status and request-to-exit device.
1. The door controller shall accept Wiegand output card readers and card formats up to 128 bits in length.
2. The door controller shall provide a complete, fully featured access control hardware and firmware infrastructure for host-based access control software applications.
3. The door controller shall communicate with the System Control Processor (SCP) with hosted access control software using RS-485 serial communication.
4. The door controller shall provide full distributed processing of all access control functions. When not connected to SCP the unit shall locally process access requests based on facility code.
5. The Door Controller shall have the following functionality:
a. Primary Port: RS-485.
b. 1 reader port: Magnetic stripe, Wiegand, ODSP (Open Supervised Device Protocol) and proximity card readers.
c. 2 programmable inputs for door contact and request to exit (REX).
d. 1 dedicated tamper input.
e. Two outputs; one dedicated for a strike (Form C, 1A @ 28Vdc) and one general purpose (Form C, 5A @ 28Vdc)
f. Up to 8 facility codes may be active in each unit.
6. Manufacturer and Model: Mercury MR-50/52 formatted for S2 or S2 ACM Blade.

2.4 POWER SUPPLIES

A. Access Control Power Supply
1. Product Description: Each door must be labeled and have a separate fused (1 AMP) power supply with:
2. 12VDC output
3. 115VAC input voltage
4. Filtered and electronically regulated Output
5. Short circuit and regulated output
6. Automatic switch over to stand-by battery
7. Built in charger for sealed lead acid or gel type batteries
8. Provide Two (2) 7AH batteries
9. Notification for loss of AC Power
10. Manufacturer and Model: Altronix AL1012 ULX8 with fused distribution or approved equal. Altronix PD8 Block or approved equal.

B. Access Control Output Board
1. Product Description:
2. 12 to 24 volt AC or DC operation
3. Eight (8) independently controlled outputs
4. Eight (8) fail safe and/or fail safe power outputs
5. Shall be mounted in same enclosure as the Altronix AL1012ULX8 Manufacturer and Model: Altronix PD8 Block or approved equal.

2.5 MISCELLANEOUS DEVICES

A. Magnetic Door Contacts
   1. All doors with a card reader and electronic lock must have a Door Position Switch.
   2. Refer to Door Hardware specification section 087100.

2.6 WIRE AND CABLE

A. Product Description: Power limited cable, copper conductor; 300 volts insulation rated (24 degrees C).

B. All CAT6 cable shall be installed with a maximum distance of 300 feet. All CAT6 cable and patch cables for security equipment shall be the color orange. All provided CAT 6 cable shall conform to the standards per section 271010. Provide test reports showing all wire tests were completed per section 271010 prior to system startup.

C. Refer to contract drawings for wire types and sizes. Provide wire per manufacture's recommendations if they are more stringent than what is shown on the contract drawings. Communications cable used to connect mercury access control panel (ACP) shall meet RS485 specification: 2 conductor separate ground and drain, Shielded.

D. All wire shall be in conduit.

E. Provide 2 conductor #16 AWG for cable lengths over 140 feet for exterior doors equipped with electronic locking device.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The security access system Vendor under direction of the Owner, shall program the entire security access system. This shall include entering all card holder information and the setting up of card holder access accounts. Programming shall also include setting up Owner specified auxiliary functions such as camera capture, time delays, etc. A meeting shall be held a minimum of four (4) weeks prior to final acceptance of the system to discuss Owner operations and programming requirements. Those in attendance shall be the Owner, Contractor, Vendor, and Owners Representative. The system shall be fully programmed prior to system acceptance testing and training. All connections to the S2 electronic equipment including CR, ACP, REX, EL and the programming of this equipment must be performed by an S2 certified integrator.

B. The vendor shall coordinate all security system design and installation with Facilities, Campus Telecom and all on site affected building trades (Finish Hardware, Electrical, etc.) for areas of responsibility and execution of related work.

C. Provide all necessary systems software, on site programming, systems integration and reporting to existing Campus security head-end at University Police; and all necessary testing and adjustments for a fully functional Card Access and/or Surveillance system.

D. Vendor to supply and install necessary low voltage and line voltage wiring systems with new electrical raceway and conduit system (as indicated in contract documents). Provide all required electrical rough-in and finish work as necessary to complete the systems wiring.

E. Vendor shall be responsible for verifying all conditions at the work site for completing installations, and shall verify all dimensions, existing conduit and required new raceways prior to the bid.

F. Vendor is responsible for layout and routing of conduit, and shall provide all additional raceways, junction boxes, cabinets, fixtures and other components to complete the new system.

G. All work shall be completed to comply with NEC, NFPA and federal regulations and NYS State Building Code requirements. All equipment shall be UL Label. All electrical wiring and enclosures shall comply with NEC and Campus Standards ELECTRICAL. Vendor shall be responsible for appropriate wire size for all power supplies, and quantity of power suppliers for a fully functional system.

H. The Vendor shall deliver "As Built" schematic of installation and all Warranties to Facilities; and complete all necessary training of designated Campus staff with use, operations and maintenance of new installations.

3.2 FIELD QUALITY CONTROL

A. Testing

1. Preliminary Tests: Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed device. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional. All testing shall be completed and documented by the Vendor.
2. Final Acceptance: The system will be accepted only after satisfactory test of the entire system has been accomplished by a factory-trained distributor, in the presence of the Authority Having Jurisdiction, the Owner, and the Owners Representative. The Vendor shall notify the above witnesses, in writing, 72 hours prior to the commencement of testing.
3. The Vendor shall provide the on-site services of an authorized technical representative of the manufacturer to supervise all connections and fully test all components of the system installed. The Vendor, as directed by the Owner, shall conduct the acceptance test. The system shall be tested with the minimum required tests as follows:
    a. Verify the absence of unwanted voltages between circuit conductors and ground.
    b. Test all conductors for short circuits using an insulation-testing device.
    c. With each circuit pair, short circuit at the far end and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.
    d. Verify that the control panel is in normal condition.
    e. Test each peripheral device for proper signal transmission.
    f. Test entire system for proper operation and response at the control unit.
    g. Test both primary and secondary power supplies.
    h. Operation of each control, alarm, and monitoring point in the system and integration with other building systems.
    i. Simulate loss of communications between each controller and the host computer.
    j. Report generation.
    k. Provide testing and reporting of all network cables per specification 271010.
    l. Provide testing of REX and DC.
4. The Vendor shall provide test sheets to document all tests. These will be signed by all present to verify testing is complete
5. If any part of the test fails to meet the performance of the Contract Documents, the Vendor and or Electrician, at their own expense, shall retest the complete system with all applicable parties present.
6. Prior to the final testing, the Vendor shall perform tests on all systems to insure proper operation.

3.3 DEMONSTRATION AND TRAINING

A. The Vendor shall provide a minimum of 20 hours of training. The sessions shall be broken up into an indefinite number dictated by the owner and shall consist of instruction and operation, maintenance and programming of all elements of the security access system.

B. Instruction shall be provided by a material or system manufacturer's certified representative familiar with the equipment and special operating requirements of the system provided and the Owner's operating procedures.

C. Instructions shall include classroom training as well as hands on training of all user level programming and system operation.

D. Instruction shall be made available on a schedule acceptable to the Owner and the availability of the operating personnel. Instructions shall be in two separate groupings with the last instruction time frame 30 days after the second grouping. This is to allow the operating personnel to familiarize themselves with the equipment and get follow-up training as required. The last training session shall be a minimum of 2 hour(s).

E. The Vendor shall be responsible for providing sufficient training materials for all present at the training session, (minimum 15 personnel). Coordinate actual requirements with the Owner at time of training.

F. The Vendor shall be responsible for providing video recording of at least one of the training sessions, which will be submitted to the owner for future employee training. The video shall be submitted to the owner is a digital format via USB or DVD.

3.4 **WARRANTY**

A. Call back response time shall be 24 hours 7 days a week.

B. On-site response time shall be 24 hours 7 days a week.

END OF SECTION

SECTION 282300
VIDEO SURVEILLANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cameras.

B. Control equipment.

C. Cable and accessories.

1.2 RELATED REQUIREMENTS

A. Section 281300 - Security Systems.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008

1.4 SYSTEM DESCRIPTION

A. Description: Provide Cat-6 cable from camera to local IDF. Cable must meet requirements, testing, labeling as outlined in Structured Cabling section 271010

B. Components:
   1. Cameras:.
   2. PoE power adapters as required.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate electrical characteristics and connection requirements, including system wiring diagram.

C. Product Data: Provide showing electrical characteristics and connection requirements for each component.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Project Record Documents: Record actual locations of cameras and routing of Cat-6 cable.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 OPERATION

A. Provide all labor, materials, equipment, and services to perform all operations required for a complete installation and related work as shown in all contract documents. Where a box is required, the cameras use a 4" 2 gang box, deep where possible.

B. The Security Contractor shall provide all equipment and accessories for a complete CCTV security system as described herein and shown on drawings.

C. Model numbers numbers and designations, which appear herein, indicate design, quality, and type of material as well as operating characteristics.

D. The entire system shall be warranted against failure and installation defects for a period of two (2) years from the Date of the Acknowledged Owner Acceptance of the final test.

E. Deliverables
   1. Includes

a. Working camera/CCTV system using specified materials

F. Responsibilities
1. Contractor
a. Supply cameras and materials, run and test camera wiring and connections
b. Coordinate with campus Telecommunications for programming and testing of camera system.
c. Supply cameras and purchase licence.
2. College
a. Campus to provide the network PoE switch at IDF.

G. Campus Telecommunications Department Contact Information
1. Jay Palen
a. E-mail: palenj@newpaltz.edu <mailto:palenj@newpaltz.edu>
b. Phone: 845-257-3993
c. Fax: 845-257-3004
2. Will White
a. E-mail: whitew@newpaltz.edu <mailto:whitew@newpaltz.edu>
b. Phone: 845-257-3002
c. Fax: 845-257-3004

PART 2 PRODUCTS

2.1 GENERAL

A. All cameras shall have connectivity to the local Network IDF to enable recording to the campus NVR.

B. Provide all materials and appurtenances for a complete and operating system.

2.2 COMPONENTS

A. Manufactures:
1. CCTV
a. Cameras by Axis Communications
b. NVR - Milestone Corporate camera license and 1 year premium SUP (1 of each per camera) by Milestone Systems.

B. Interior cameras to be Axis communications P3225-V MK2 (0952-001). Camera model to be updated with SUNY New Paltz Telecommunications at time of purchase (in case comparable newer model availability).

C. Exterior Dome - Axis Communications P3225-VE MK2 (0953-001). Camera model to be updated with SUNY New Paltz Telecommunications at time of purchase (in case comparable newer model availability).

D. Exterior Non-Dome - Axis Communications Q1615-E MK2 (0884-001). Camera model to be updated with SUNY New Paltz Telecommunications at time of purchase (in case comparable newer model availability).

E. Exterior Pan, Tilt, Zoom - Axis Communications Q6055-E (0910-004). Camera model to be updated with SUNY New Paltz Telecommunications at time of purchase (in case comparable newer model availability).

F. Contractor to provide correct wall, pendant, corner, or other mount as directed by SUNY Telecommunications and as appropriate to the install location.

G. Campus will supply PoE power to all non-heated cameras. Contractor must provide appropriately sized Axis PoE mid span for any camera requiring 30W or higher power.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide wiring of types and size as recommended by the component manufacturer.Video surveillance system cable must be installed using approved support system from section 271009 Structured Telecommunications Cabling and Enclosures.

C. Follow the same labeling specification as for other category 6 network drops.

D. Contractor to coordinate with campus Telecom staff for aim, focus and zoom of cameras and this cannot be completed until the telecom rooms are turned over and fully built out by telecom staff.

3.2 FIELD QUALITY CONTROL

A. Provide the services of manufacturer's technical representative to prepare and start systems and supervise final wiring connections and system adjustments.

3.3 CLOSEOUT ACTIVITIES

A. Conduct walking tour of project and briefly describe function, operation, and maintenance of each component.

3.4 MAINTENANCE

A. Provide service and maintenance of system for one year from Date of Substantial Completion.

END OF SECTION

SECTION 283100
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section covers fire alarm system design and installation, including all: initiating devices, notification appliances, controls, supervisory devices, including all components, wiring, and conduit.

B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.

C. The Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
   1. Fire alarm and detection operations.
   2. Control and monitoring of elevators, smoke control equipment, fire suppression systems, and other equipment as indicated in the drawings and specifications.

D. Maintenance of fire alarm system under contract for specified warranty period.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 078400 - Firestopping: Materials and methods for work to be performed by this installer.

C. Section 087100 - Door Hardware: Electrically operated door holder devices to be monitored and released by fire alarm system.

D. Section 211300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

E. Section 142100 - Passenger Elevators: Electric transaction elevators.

F. Section 233300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

G. Section 28 1300 - Access Control.

H. Section 275117 - Intertelecommunication and Mass Notification System

1.3 REFERENCE STANDARDS

A. The system and all associated operations shall be in accordance with the following:
   1. Building Code of New York State (2015)
   2. Fire Code of New York State (2015)
   3. NFPA 70 - National Electrical Code; 2014.
   4. NFPA 72 - National Fire Alarm Code; 2013.
   5. Mechanical Code of New York State (2015)
   6. Local Jurisdictional Adopted Codes and Standards.
   7. ADA Accessibility Guidelines.

1.4 SYSTEM DESCRIPTION

A. General: Provide a complete, non-coded, addressable, microprocessor-based fire alarm system with initiating devices, speakers, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein. System shall be compatible with the existing campus standard Edwards system. Provide Edwards EST3. Provide all programing and graphics for the Head End Unit as required

B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of storing, and downloading while the system is in operation, a second set of operating software resident in the control panels as backup in case primary operating software is corrupted. In addition, the system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory.

C. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

D. Wiring/Signal Transmission:
   1. Transmission shall be as required addressable signal transmission, dedicated to fire alarm service only.
   2. System connections for initiating (signaling) circuits and notification appliance circuits shall be Class A.
   3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.

E. Required Functions: The following are required system functions and operating features:
   1. Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.
   2. The activation of an addressable device does not prevent the receipt of signals from subsequent addressable device activations.
   3. Transmission to Campus Security: Automatically route alarm, supervisory, and trouble signals to Campus Security.
   4. Annunciation: Operation of alarm and supervisory initiating devices, and troubles shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.
   5. General Alarm: A system general alarm shall include:
      a. Indication of alarm condition at the FACP and the annunciator.
      b. Identification of the device that is the source of the alarm at the FACP and the annunciator.
      c. Operation of speakers and visible notification devices throughout the building until silenced at FACP, except as specified otherwise for sounder base smoke detector sequence. Refer to 1.4 F.1.e through 1.4 F.1.h.
      d. Closing of smoke dampers universally on system alarm.
      e. Notifying Campus Security. Transmit a signal to campus police head-end unit located in the service building, through the fiber network.
      f. Initiation of elevator recall in accordance with ASME/ANSI A17.1, when specified elevator lobby smoke detectors are activated.
      g. Sounder base shall activate in all bedrooms.
   6. Supervisory Operations: Upon activation of a supervisory device such as carbon monoxide detection, and tamper switch, the system shall operate as follows:
      a. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the graphic annunciator.

b. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
c. Record the event in the FACP historical log.
d. Transmit a signal to campus police head-end unit located in the service building.

7. Restoring the condition shall cause the Supervisory LED restore system to normal.
8. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation.
9. System Reset:
   a. The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
   b. Should an alarm condition continue, the system will remain in an alarmed state.
10. Fire alarm system shall have ability to silence the alarm in the building from one main point.

F. Sequence of Operation
1. The fire alarm system shall operate as follows:
   a. Manual Operation - operation of a manual alarm pull station shall:
      1) Identify the individual station on the system control panel and sound the alarm at the control panel and remote alarm panels.
      2) Sound all audible alarms and actuate strobes.
      3) Transmit a signal to campus police head-end unit located in the service building.
      4) Close smoke dampers.
   b. Activation of an area smoke detector or heat detector, or water flow switch activating the exterior sprinkler bell shall cause the following:
      1) Provide operation as described for manual fire alarm pull station.
      2) A signal dedicated to the exterior sprinkler alarm bell shall not be able to be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.
   c. Activation of any supervisory circuit shall cause the following actions and indications:
      1) Display the origin of the supervisory condition report on the alphanumeric LCD display at the control panel and remote annunciator panels.
      2) Activate supervisory audible and visual signals at the control panel and remote annunciator panels.
      3) Record the occurrence of the event, the time of occurrence and the device initiating the event.
      4) Transmit a signal to campus police head-end unit located in the service building.
   d. Receipt of a trouble signal at the fire alarm control panel shall cause the following actions and indications:
      1) Display at the control panel and remote annunciator panels alphanumeric LCD display, the origin of the trouble condition report.
      2) Activate trouble audible and visual signals at the fire control panel and remote annunciator.

3) Record the occurrence of the event, the time of occurrence and the device initiating the event.
4) Transmit a signal to campus police head-end unit located in the service building.

e. Upon alarm activation of sounder base smoke detection (1st device),
1) All sounders within the room, suite or apartment shall sound .
2) If strobes are located within the room, suite or apartment they shall flash.
3) The alarm shall be reported to the building fire alarm control panel.

f. Upon activation of any other detector (2nd device) within the building, including other detectors in the suite or apartment will cause the following actions:
1) Cause the general alarm.
2) Activating all visual and speaker alarm devices including all sounder bases throughout building.

g. Upon alarm activation of a system device, i.e. Area smoke detector, heat detector, water flow switch, pull station ect. Will cause the following actions:
1) A general alarm shall be initiated throughout the building.

h. A general alarm shall include the activation of the following:
1) Activation of all sounder base smoke detector integral alarms.

i. Activation of elevator Lobby smoke detector shall cause fireman's hat to illuminate solid as per recall.

j. Activation of a smoke detector in any elevator lobby, on other than the designated primary recall level, shall cause the car that servers that lobby to return nonstop to the designated level. The operation shall conform to the requirements of NYS IBC and ASME A17.1. When the smoke detector at the designated level is activated, the operation shall conform to the requirements of NYS IBC and ASME A17.1, except that the car shall return to an alternate level approved by the enforcing authority, unless the designated-level three-position Phase I switch is in the "ON" position.
1) Activation of a smoke detector in the fourth floor elevator controller room, except an equipment room at the designated primary recall level, shall cause the elevator having any equipment located in that equipment room, to return nonstop to the designated level.
2) The activation of a smoke detector in the equipment room shall cause fireman's hat to illuminate flashing as per elevator recall.

k. Transmit a signal to campus police head-end unit located in the service building.

G. Smoke Detectors: A maintenance and testing service providing the following shall be included with the base bid:
1. Biannual sensitivity reading and logging for each smoke sensor.
2. Scheduled biannual threshold adjustments to maintain proper sensitivity for each smoke sensor.
3. Threshold adjustment to any smoke sensor that has alarmed the system without the presence of particles of combustion.
4. Scheduled biannual cleaning or replacement of each smoke detector or sensor within the system.
5. Semi-annual functional testing of each smoke detector or sensor using the manufacturer's calibrated test tool.
6. Written documentation of all testing, cleaning, replacing, threshold adjustment, and sensitivity reading for each smoke detector or sensor device within the system.

7. The initial service included in the bid price shall provide the above listed procedures for a period of five years after owner acceptance of the system.

H. Audible Alarm Notification: By speakers in areas as indicated on drawings, and sounder bases in bedrooms.

I. Power Requirements:
   1. The control unit shall receive 120 VAC power via a dedicated circuit.
   2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 90 hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
   3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
   4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.
   5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
   6. The system shall support Notification Appliance Circuits (NAC) Lockout feature to prevent subsequent activation of NAC after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.
   7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
   8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.5 REFERENCE STANDARDS

A. The system and all associated operations shall be in accordance with the following:
   1. Guidelines of the following building code - IBC.
   2. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   3. NFPA 72 - National Fire Alarm Code; 2013.
   4. Local Jurisdictional Adopted Codes and Standards.
   5. ADA Accessibility Guidelines.

1.6 SUBMITTALS

A. Refer to Administrative Requirements, for submittal procedures.
   1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
   2. Wiring diagrams from manufacturer.
   3. Shop drawings showing system details including location of FACP, all devices, circuiting and details of graphic annunciator.
   4. System Power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.
   5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output

points in the system shall be provided with a label indicating location or use of IDC, NAC, relay, Sensor, and auxiliary control circuits.

6. Operating instructions for FACP.
7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
    a. Have one set available during closeout demonstration.
    b. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
    c. List of recommended spare parts, tools, and instruments for testing.
    d. Replacement parts list with current prices, and source of supply.
    e. Detailed troubleshooting guide and large scale input/output matrix.
    f. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
9. Record of field tests of system.

B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.

C. Evidence of installer qualifications.

D. Evidence of instructor qualifications; training lesson plan outline.

E. Inspection and Test Reports:
    1. Submit inspection and test plan prior to closeout demonstration.
    2. Submit documentation of satisfactory inspections and tests.
    3. Submit NFPA 72 "Inspection and Test Form," filled out.

F. Operating and Maintenance Data: have one set available during closeout demonstration:
    1. Complete set of specified design documents, as approved by authority having jurisdiction.
    2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
    3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
    4. List of recommended spare parts, tools, and instruments for testing.
    5. Replacement parts list with current prices, and source of supply.
    6. Detailed troubleshooting guide and large scale input/output matrix.
    7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
    8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

G. Project Record Documents: Have one set available during closeout demonstration:
    1. Complete set of floor plans showing actual installed locations of components, conduit, and addresses.
    2. "As installed" wiring and schematic diagrams, with final terminal identifications.

3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

1.7 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer.

B. Installer Qualifications: Firm with minimum 10 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
   1. Authorized factory representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
   2. Installer Personnel: At least 3 years of experience installing fire alarm systems.
   3. Supervisor: NICET level III or IV certified fire alarm technician; furnish name and address.
   4. Contract maintenance office located within 150 miles of project site.
   5. Licensed in the State in which the Project is located as fire alarm installer.

C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

D. Comply with NFPA 70.

E. Products: Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.8 EXTRA MATERIALS AND TOOLS

A. General: Provide spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data.
   1. Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.
   2. Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.
   3. Smoke Sensors, Fire Sensors, and Flame Sensors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.
   4. Sensor Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after Date of Substantial Completion.

C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. This product is Proprietary as approved by DASNY as a sole source exempt material to meet the college requirements. No product substitutions will be considered.
   1. Manufacturers: The equipment and service described in this specification are those supplied and supported by Edwards Systems Technology and represent the base bid for the equipment. Fire Alarm system shall be purchased from an Edwards Authorized vender for the area of installation (Sean Reilly 518-512-3074 Fire Security and Sound). Edwards EST3 System.
   2. The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and NICET certified technicians, and shall maintain a service organization within 150 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.
   3. Initiating Devices, and Notification Appliances:
      a. Same manufacturer as control units.
      b. Provide all initiating devices and notification appliances made by the same manufacturer.

2.2 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new Edwards microprocessor based, addressable, and intelligent, Fire Alarm System for the building including: all new audible alarms, visual alarms, intelligent smoke detectors, addressable detection devices, addressable manual stations, wire, valve supervisory switches, flow switches, and pressure switches. System shall include any miscellaneous hardware as required for proper system operation. System shall utilize digital transmission for data information between devices, monitor, control devices, and fire alarm panel. Provide programing as required for connection to campus system. Fire Alarm system shall be purchased from an Edwards Authorized vender for the area of installation (Sean Reilly 518-512-3074 Fire Security and Sound).
   1. Provide all components necessary, regardless of whether shown in the contract documents or not.
   2. Protected Premises: Entire Building.
   3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. ADA Standards for Accessible Design.
      b. The requirements of the State Fire Marshal.
      c. The requirements of the local authority having jurisdiction..
      d. Applicable local codes.
      e. The contract documents (drawings and specifications).
      f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on submittals.
   4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
   5. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
   6. Program notification zones as directed by Owner.
   7. System shall close doors normally held open by magnetic door holders.

8. Contractor shall hire facilities vender (Sean Reilly 518-512-3074 Fire Security and Sound), for all programming of the system, re-programming of the campus fire alarm system, and all required testing, training, ect.

B. Supervising Stations and Fire Department Connections:
   1. Public Fire Department Notification: By on-premises supervising station.
   2. On-Premises Supervising Station: Campus Security

C. Circuits:
   1. Initiating Device Circuits (IDC): Class A.
   2. Signaling Line Circuits (SLC): Class A.
   3. Notification Appliance Circuits (NAC): Class B.

D. Power Sources:
   1. Primary: Dedicated branch circuits of the facility power distribution system.
   2. Secondary: Storage batteries.
   3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

E. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.

F. Mass Notification:
   1. Provide system interface connection with campus standard mass notification system. fire alarm system speakers shall be used as mass notification voice annunciator devices, and fire alarm strobes shall be used for visible notification.
   2. Provide all programming and equipment modifications to FACP and campus mass notification system with modules, relays, power supplies, and other components necessary for a complete and operational system.
   3. Mass notification systems integrated with the building fire emergency voice/alarm communication system, must follow pathway survivability level 2, that requires 2-hour fire rated circuit integrity (CI) cable for notification appliances, as per NFPA 72 24.3.5.4.1.
   4. The local building mass notification system shall have the ability to override the fire alarm system with live voice or manual activation of a high priority message. Messages from the mass notification system shall take priority over fire alarm messages and signals. If the fire alarm system is in the alarm mode and a recorded message, or voice message or the audible signals are sounding, and the mass notification system is actuated, it shall cause the de-activation of all fire alarm-initiated audible and visible notification appliances, unless they are used for mass notification use. After the mass notification system relinquishes control, the following will occur: Without an active fire alarm signal, fire alarm system shall automatically restore to normal operation, With an active fire alarm signal, the fire alarm system shall operate based on the emergency response plan. Unless determined otherwise the fire alarm system should always be automatically returned to normal functionality. Deactivation of the fire alarm audible and visual notification signals shall cause an individually identified supervisory signal to be initiated at the building fire alarm control panel. The fire alarm deactivation function shall be permitted to occur only when both the fire alarm system is in an alarm condition and the voice message is initiated by the mass notification system. When the fire alarm system is overridden, then all other features of the fire alarm system shall remain unaffected.

2.3 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
   1. Sprinkler water control valves (non-latching).
   2. Carbon Monoxide detection (latching).

3. Mass notification priority (non-latching).
4. ERU-1 and ERU-2 shutdown.
5. Fire pump interconnection/monitoring of.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
2. Kitchen hood suppression activation; also disconnect fuel/power sources from cooking equipment.
3. Duct smoke detectors.

C. Elevators:
1. Elevator lobby: Elevator recall for fire fighters' service.
2. Elevator lobby detectors.
3. Elevator controller location smoke detector.

D. HVAC:
1. Duct Smoke Detectors: Close dampers shut down air handler units with return air systems greater than 2000 CFM, upon detection of smoke.

E. Doors:
1. Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.

2.4 COMPONENTS

A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
3. Existing fire alarm devices removed shall be cataloged and turned over to the owner with receipt.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: addressable type; listed by Underwriters Laboratories as suitable for the purpose intended.
1. Shall comply with UL 864, "Control Units for Fire-Protective Signaling Systems".

C. Fire Alarm Control Panel:
1. The fire alarm control panel or panels and all system devices (Speaker-strobes, strobes, pull stations, smoke and heat detectors, etc. shall be Edwards, A UTC Fire & Security CO. EST brand type EST3 series (or accepted equal). All under one label "UL listed and approved" for the use of fire alarm systems in this area of the United States of America. The operating controls shall be located behind locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified.
2. System Controllers
a. The main controller 3-CPU shall be supervised, site programmable, and of modular design supporting up to 125 detectors and 125 remote modules per addressable Signaling line Circuit (SLC). The CPU shall support up to 10 SLC's per panel for a total system capacity of 2500 Intelligent Addressable points. The system shall be designed with peer-to-peer networking capability for enhanced survivability, with support for up to 64 modes, each with up to 2500 points and an overall capacity of 160,000 points. The cabinets shall be steel.
3. The system shall store all basic system functionality and job specific data in non-volatile memory. All site specific and operating data shall survive a complete power failure intact. Passwords shall protect any changes to system operations.

4. The Main Controller Module shall control and monitor all local or remote peripherals. It shall support a large 960 character LCD, power supply, remote LCD and zone display annunciators, printers, and support communication interface standard protocol (CSI) devices such as color computer annunciators and color graphic displays. If configured as a network, each system shall display each and every point in the system and shall also support up to 64 remote LCD display annunciators. Remote LCD annunciators shall also display each and every point in the system and be sized with the same number of characters as in the main FACP display.
5. The panel shall have an interface module for remote site monitoring. Via fiber the alarm, supervisory and trouble signals transmit it to a Central Monitoring Station (CMS).
6. The system shall have built-in automatic system programming to automatically address and map all system devices attached to the main controller. A minimum default single stage alarm system operation shall be supported with alarm silence, event silence, drill, lamp test, and reset common controls.
7. Advanced Windows-based System Definition Utility with Program Version Reporting to document any and all changes made during system start-up or system commissioning shall be used to maintain site specific programming. Time and Date Stamps of all modifications made to the program must be included to allow full retention of all previous program version data. It shall support programming of any input point to any output point. The system shall support the use of Bar Code readers to assist custom programming functions. It shall allow authorized customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms. The system program shall meet the requirements of this project, current codes and standards, and satisfy the local Authority Having Jurisdiction.
8. The system shall support distributed processor intelligent detectors with the following operational attributes; integral multiple differential sensors, automatic device mapping, electronic addressing, environmental compensation, pre-alarm, dirty detector identification, automatic day/night sensitivity adjustment, normal/alarm LEDs, relay bases, sounder bases and isolator bases.
9. The system shall use full digital communications to supervise all addressable loop devices for placement, correct location, and operation. It shall allow swapping of "same type" devices without the need of addressing and impose the "location" parameters on replacement device. It shall initiate and maintain a trouble if a device is added to a loop and clear the trouble when the new device is mapped and defined into the system.
10. Each controller shall contain a RS232 printer/programming port for programming locally via an IBM PC. When operational, each controller shall support a printer through the RS232 port and be capable of message routing.
11. System circuits shall be configured as follows: Addressable analog SLC loops Class B (Style 4); Initiating Device Circuits Class B; Notification Appliance Circuits Class B; Network Communications Class B; Annunciator Communications Class B.
12. Single stage operation shall be provided.
13. The system shall have a UL Listed Detector Sensitivity test feature, which will be a function of the smoke detectors and performed automatically every 4 hours.
14. The system shall support 100% of all remote devices in alarm and provide support for a 100% compliment of detector isolator bases.
15. All panel modules shall be supervised for placement and return trouble if damaged or removed.

16. The system shall have a CPU watchdog circuit to initiate trouble should the CPU fail.
17. The Fire Alarm / Life Safety System shall incorporate a true digital integrated audio system into the network, multiplexing 8 independent audio channels over a single pair of wires. The system shall include distributed audio amplifiers, one for each speaker circuit, for the ultimate in system survivability. The system shall provide a local temporal back up tone at each amplifier to allow evacuation signals to be broadcast in the protected premises in the event of a loss of data communication from the multiplexed audio riser.
    a. A digital message unit shall be provided which provides up to 32 minutes of pre-recorded emergency messaging. The message contained in the fully digital message unit shall be recordable in the field on a computer.

D. Remote LCD Annunciators:.
1. Provide two (2) Remote LCD Annunciator with same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs and LCD Display as the FACP.
2. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.
3. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.
4. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
5. The LCD shall display the following information relatives to the abnormal condition of a point in the system:
    a. 40 character custom location label.
    b. Type of device (e.g., smoke, pull, waterflow)
    c. Point status (e.g., alarm, trouble)
6. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

E. Emergency Power Supply:
1. General: Components include battery, charger, and an automatic transfer switch.
2. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 90 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 15 minutes.

F. Initiating Devices:
1. Manual Pull Stations: Edwards SIGA - 278 or approved equal. Addressable, Dual -action type, red metal, and finished in red with molded, raised-letter operating instructions of contrasting color. Station shall mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

G. Smoke Detectors (Edwards 85001-0247 series or approved equal):
1. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:

a. Factory Nameplate: Serial number and type identification.
b. Operating Voltage: 24 VDC, nominal.
c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
d. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
e. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
f. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
g. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
h. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
i. Addressability: Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
j. Removal of the sensor head for cleaning shall not require the setting of addresses.
k. Addressable programmable Sounder bases: Provide proper sounder base sequence. Sounder base shall be silenceable upon alarm silence activation at the Fire alarm control panel.

2. Smoke Sensors: Shall be of the photoelectric type. Where acceptable per manufacturer specifications, ionization type sensors may be used.

H. Smoke Detectors with CO Sensor (Edwards SIGA2-PCOS or approved equal):
1. Provide with same requirements as standard smoke detectors list above.
2. Provide with an advanced carbon monoxide sensor and associated daughterboard. The sensor/daughterboard module shall be field replaceable.

I. Audible Base for CO and Smoke Detectors(Edwards SIGA-AB4GTor approved equal):
1. Provide distinct signal for fire alarm vs CO activation.
2. Provide low frequancy type 520 Hz in bedrooms.
3. Shall be 75 decibels required at the pillow per NFPA 72.

J. HEAT SENSORS:
1. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.
2. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.

3. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.
4. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

K. ADDRESSABLE ALARM-NOTIFICATION APPLIANCES:
1. Addressable Notification Appliances: The Contractor shall furnish and install Addressable Notification Appliances and accessories to operate on compatible signaling line circuits (SLC).
   a. Addressable Notification appliance operation shall provide power, separate control, and supervision of speakers and strobes over a single pair of wires. The controlling channel SLC digitally communicates with each appliance and receives a response to verify the appliance's presence on the channel. The channel provides a digital command to control appliance operation. SLC channel wiring shall be unshielded twisted pair (UTP), with a capacitance rating of less than 60pf/ft and a minimum 3 twists (turns) per foot.
   b. Class B (Style 4) notification appliances shall be wired without requiring traditional in/out wiring methods; addressable "T" Tapping shall be used. Up to 63 appliances can be supported on a single channel.
   c. Each Addressable notification appliance shall contain an electronic module and a selectable address setting (in addition to its notification appliance circuit) to allow it to occupy a unique location on the channel. This on-board module shall also allow the channel to perform appliance diagnostics that assist with installation and subsequent test operations. A visible LED on each appliance shall provide verification of communications and shall flash with the appliances address setting when locally requested using a magnetic test tool.
2. Addressable Controller: Addressable Controller shall supervise Channel SLC wiring, communicate with and control addressable notification appliances. Speaker appliances shall have adjustable settings.
3. Speakers and Speaker Strobes, Genesis Series: Provide speakers with a 4" cone as manufactured by EST, Cat. No. G4-S7 Genesis Series. The rear of the speaker shall be completely sealed protecting the cone during and after installation. Screw terminals shall be provided for wiring and the speaker housings shall be white. Speakers shall be provided for use with 70V systems and shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Speakers shall provide UL confirmed 90 dBA sound output at 2w. Speakers shall mount in a North American 4" electrical box with extension ring using the 2 screws provided with ring. It must not be necessary to completely remove the screws to facilitate mounting. Speaker and speaker strobes shall be white with "ALERT" only on them, since used for fire alarm and mass notification.
4. Provide speaker/strobes with a 4" cone as manufactured by EST, Cat. No. G4-S7 Series. The rear of the speaker shall be completely sealed protecting the cone during and after installation and screw terminals shall be provided for wiring. Speaker/strobe housings shall be white. Speakers shall be provided for use with 70V systems and shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Provide field-selectable Candela strobes. Speaker/strobes shall provide UL confirmed 90 dBA sound output at 2w. Strobes shall provide 15/75, 30, 75 cd 110 candela*, and 177 as required synchronized flash outputs. The strobe shall be white with "ALERT" only on them, since they will be used for fire alarm and mass notification. Ceiling mounted Speaker/Strobes shall have lens markings with correctly oriented

lettering. Speaker/strobes shall mount in a North American 4" electrical box with extension ring using the 2 screws provided with ring.

5. Visible/Only: Addressable strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. V/O appliances shall be provided with field-selectable Candela strobes. Provide a label inside the strobe lens to indicate the listed candela ratings of the specific Visible/Only appliance. All strobe wiring in all suites with bedroom strobes shall be wired on independent circuits for proper strobe sequence. All strobes within room, suite or apartment shall activate on first sounder base smoke detector alarm. Strobes shall be white with "ALERT" only on them, since they are used for fire alarm and mass notification. Provide 177cd stroves in sleeping rooms.
6. Isolator Module: Isolator module provides short circuit isolation for addressable notification appliance SLC wiring. Isolator shall be listed to UL 864. The Isolator shall mount directly to a minimum 2 1/8" deep, standard 4" square electrical box, without the use of special adapter or trim rings. Power and communications shall be supplied by the Addressable Controller channel SLC; dual port design shall accept communications and power from either port and shall automatically isolate one port from the other when a short circuit occurs. The following functionality shall be included in the Isolator module:
   a. Report faults to the host FACP.
   b. On-board Yellow LED provides module status.
   c. After the wiring fault is repaired, the Isolator modules shall test the lines and automatically restore the connection.
7. Accessories: The contractor shall furnish the necessary accessories.

L. ADDRESSABLE CIRCUIT INTERFACE MODULES

1. Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.
2. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two wire pair running from an appropriate power supply as required.
3. There shall be two types of modules:
   a. Type 1: Monitor Circuit Interface Module:
      1) For conventional 2-wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision. The supervision of the zone wiring will be Class B. This module will communicate status (normal, alarm, trouble) to the FACP.
      2) For conventional 4-wire smoke detector with Class B wiring supervision. The module will provide detector reset capability and over-current power protection for the 4-wire detector. This module will communicate status (normal, alarm, trouble) to the FACP.
   b. Type 2: Line Powered Monitor Circuit Interface Module
      1) This type of module is an individually addressable module that has both its power and its communications supplied by the two wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module

shall communicate four zone status conditions (normal, alarm, current limited, trouble) to the FACP.

4. All Circuit Interface Module shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.
5. Provide elevator control modules for primary recall, alternate recall, and fireman's hat.

M. ELECTROMAGNETIC DOOR HOLDERS
1. Description: Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Rated 24 vac/dc.
2. Provide power module(s) as necessary.
3. Material and Finish: Match door hardware.

N. Audio System source Unit (Edwards 3-ASU series)
1. Provide a true digital integrated audio system, multiplexing 8 independent audio channels over a single pair wires. The system shall include audio amplifiers, one for each speaker circuit, for ultimate in system survivability. The system shall provide a local temporal back up tone at each amplifier to allow evacuation signals to be broadcast in the protected premises in the event of a loss of data communication from the multiplexed audio riser. Provides for local and remote audio for the system. Listed for mass notification systems. Auxiliary audio input interface for connection to the campus mass notification system. Provide a paging microphone, digital message playback unit, and 8 fully digitized and multiplexed audio channels. Four dedicated page mode control switches shall provide the emergency operator with instantaneous one touch paging to safely control the staged evacuation of the building occupants. Automatic programming shall dynamically group the most frequently targeted paging zones.
   a. All Call - Switch will direct the manual page to entire facility.
   b. Page to Evac - Switch will direct the manual page to those building areas automatically receiving the evacuation signal.
   c. Page to Alert - Switch will direct the manual page to those building areas automatically receiving the alert signal.
   d. All Call Minus - Switch will direct the manual page to those building areas which are programmed to receive the auxiliary and general channel connections.
   e. The system shall have paging control switches and LEDs to support specific zone selection as required. Alarm notification in all zones on the same floor, on the floor above, and the floor below. Program notification zones and voice messages as directed by campus. The zone control displays shall confirm amplifier selection and annunciate amplifier and amplifier circuit trouble.
   f. Provide posted instructions at FACP for one-way voice communication.
2. The system shall automatically deliver a preannounce tone of 1000Hz for three seconds when the emergency operator presses the microphone talk key. A 'ready to page' LED shall flash during the preannounce and turn steady when the system is ready for the user's page delivery. The system shall include a page deactivation timer which activates for 3 seconds when the emergency user release the microphone talk key. Should the user subsequently press the microphone key during the deactivation period a page can be delivered

immediately. Should the timer complete its cycle the system shall automatically restore emergency signaling and any subsequent paging will be preceded by the pre-announce tone. A VU display shall display voice level to the emergency operator.

O. Audio Amplifiers:
   1. Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any one of eight digitized audio channels. The channel selection shall be directed by the system software. Up to 8 multiple and different audio signals must be able to be broadcast simultaneously from the same system network node.
   2. Each amplifier output shall include a dedicated, supervised 25/70 Vrms speaker circuit which is suitable for connection of emergency speaker appliances. Each amplifier shall also include a notification appliance circuit rated at 24Vdc @ 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices.
   3. Standby Audio amplifiers shall be provided that automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.
   4. In the event of a total loss of audio data communications, all amplifiers will default to the local "EVAC" tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC signal on their connected speaker circuits.
   5. In the event of a loss of the fully digitized, multiplexed audio riser, the audio amplifiers shall automatically default to an internally generated alarm tone which shall be operated at a 3-3-3 temporal pattern.
   6. Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall inhibit itself from driving into that short circuit condition.

P. Power Supplies: The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 7.0A continuous for notification appliance circuits. The power supply shall be capable of providing 7A to output circuits for a maximum period of 100 ms. All outputs shall be power limited. The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current plus general alarm for 15 minutes.

Q. Auxiliary power supplies shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 7.0A continuous for notification appliance circuits. The power supply shall be capable of providing 7A to output circuits for a maximum period of 100 ms. All outputs shall be power limited. The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current plus general alarm for 15 minutes.

R. Network alpha-numeric annunciators shall be located throughout the facility as indicated on the plans.
   1. The system shall have the capacity to support 64 network annunciators or EST3 network panel nodes. Each annunciator shall contain a supervised, back lit, liquid crystal with a minimum of 8 line with 21 characters per line. Where required, the

annunciator shall include additional zonal annunciation and manual control without additional enclosures. The annunciator shall support full ability to serve as the operating interface to the system and shall include the following features;

a. Matched appearance with other system displays
    1) Each LCD Display on each node (cabinet) in the system shall be configurable to show the status of any or all of the following functions anywhere in the system:
        (a) Alarm
        (b) Supervisory
        (c) Trouble
        (d) Monitor

2. Each annunciator must be capable of supporting custom messages as well as system event annunciation. It must be possible to filter unwanted annunciation of trouble, alarm or supervisory functions on a by point or by geographic area.
3. The annunciators shall be mounted in stand-alone enclosures or integrated into the network panels as indicated on the plans.

S. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

T. Network Wiring
1. The system supplied under this specification shall utilize node to node, direct wired multi-priority peer-to-peer network operations. The system shall utilize independently addressed, smoke detectors, heat detectors and input/output modules as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional node of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between a nodes.
2. When wired using a Class A configuration, a single break or short on the network wiring causes the system to isolate the fault, and network communication continues uninterrupted, without any loss of function. Should multiple wiring faults occur, the network re-configures into many sub-networks and continues to respond to alarm events from every panel that can transmit and receive network messages.

U. Network Nodes
1. The remote control panel(s) (network nodes) shall meet the same requirements as described in control panel section and shall contain the following;
    a. Common control switches with 168 character LCD display, as required.
    b. Integral power supply(s) with secondary stand-by power.
    c. Signaling line circuits for communications with analog/addressable devices, as required.
    d. Audio amplification, as required.
    e. Notification appliance circuits, as required.
    f. Auxiliary function circuits and operations, as required.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, the contract documents, and manufacturer's recommendations.

B. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre testing, testing, and adjustment of the system.

C. Installation personnel shall be qualified and experienced in the installation, inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
   1. Factory trained and certified personnel.
   2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
   3. International Municipal Signal Association (IMSA) fire alarm certified.
   4. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
   5. Personnel licensed or certified by state or local authority.

D. EQUIPMENT INSTALLATION
   1. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.
   2. Water-Flow and Valve Supervisory Switches: Provide independent monitoring of all sprinkler water flow, pressure and tamper switches. Verify required Fire Alarm descriptors with AHJ prior to programming.
   3. Provide independent monitoring of all devices/valves.
   4. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.
   5. Mounting heights for pull stations shall be 42"-48" a.f.f. to operating handle.
   6. Mounting heights for strobes and speaker/strobe signals shall be entire strobe lens 80" -96" a.f.f.
   7. Mounting heights for speaker only appliances shall be mounted so tops of speakers will be at 90" a.f.f, and a minimum 6" below ceiling.
   8. Provide a minimum 3' distance of smoke detectors from supply diffusers, return grilles or ceiling fan blades.
   9. All strobes shall be synchronized.
   10. Smoke detector in student bedrooms shall be mounted on face of soffit, centered vertically between bottom of soffit and finished ceiling (+/- 86" A.F.F.).
   11. Smoke detector in student suite shall be mounted on wall 6" from top of detector to undeside of finished ceiling (+/- 7'-6" A.F.F.).

E. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

F. Obtain Owner's approval of locations of devices, before installation.

G. Install instruction cards and labels.

H. WIRING INSTALLATION:
   1. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
   2. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.

3. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.
4. Risers: Install at least 2 vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other, in accordance with NFPA 72, with a minimum 2-hour rated cable assembly, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.
5. Wiring to Central Station Transmitter: 1-inch conduit between the FACP and the central station transmitter connection as indicated. Install number of conductors and electrical supervision for connecting wiring as required to suit central-station monitoring function. Final connections to terminals in central station transmitter are made under another contract.
6. Circuit Conductors: Copper; provide 200 feet extra; color code and label.
7. Metallic jacket wire shall be used.
8. Signaling line, initiating, and notification circuits cannot exceed 75% of the manufacturere's identified capacity.

I. Contractor will make all connections, but will hire Security and Sound for all programming, testing, and training, ect. Coordinate with Security and Sound (Sean Reilly 518-512-3074). Refer to section 3.02, and 3.04 for additional contractor requirements.

J. FACP messages must be approved by the engineer and that custom messages be provided as directed.

K. FACP descriptors utilize room/space designations and numbers to be used by the facility after occupancy and that descriptors be approved by the engineer and AHJ.

L. Contractor shall allow for three fire alarm system reprogrmmings after acceptance testing as directed by the Owner.

3.2 INSPECTION AND TESTING FOR COMPLETION

A. The contractor shall conduct a 100% pre-test of the fire alarm system as required per NFPA 72. The 100% pre-test shall include testing of all life safety functions with respective contractors (e.g. sprinkler monitoring, fan shut down, damper closure, door holder release, etc.).
1. Provide documentation of required pre-testing, including pre-testing of all life safety functions such as sprinkler monitoring, fan shut down, damper closure, and door holder release with responsible contractors. Submit pre-test documentation to Owner/AHJ prior to scheduling final acceptance testing.
2. After the fire alarm equipment vendor has performed a 100% pre-test of the system, and submitted required documentation, acceptance test of the fire alarm system shall be conducted by the contractor and the fire alarm equipment vendor with the authority having jurisdiction as directed by the Owner.
3. Prior to AHJ acceptance testing, contractor shall submit "Statement of Compliance" in accordance with FCNYS 901.2.1 requesting final acceptance test with authority having jurisdiction.
4. Contractor shall provide a "Record of Completion" form as identified in NFPA 72 figure 4-5.2.1, prior to Acceptance Testing with the AHJ.
5. Subsequent additions, modifications, and reprogramming of Fire Alarm system, including custom label changes, shall trigger Contractor Re-Acceptance Testing, and follow-up DASNY Re-Acceptance Testing.

B. Notify Owner 10 days minimum notice in writing prior to beginning completion inspections and tests.
   1. An acceptance test of the fire alarm system shall be conducted by the contractor and the fire alarm equipment vendor as directed by the Owner after the fire alarm equipment vendor has preformed a 100% test of the system.
   2. Prior to the acceptance testing the contractor shall complete and submit the record of completion form as identified in NFPA 72 (2007) Figure 10.4.1.2.
   3. Contractor to submit a copy of the Fire Alarm Statement of Compliance as required for the fire alarm systems per FCNYS 901.2.1.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

E. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required. Provide documentation of required pre-testing, including pre-testing of all life safety functions such as sprinkler monitoring, elevator recall and shunt trip, kitchen suppression and door holder release with responsible contractors. Submit pre-test documentation to Owner/AHJ prior to scheduling final acceptance testing.

F. Provide all tools, software, and supplies required to accomplish inspection and testing.

G. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

H. Determine, through pre testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre testing. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

I. Final Test, Certificate of Completion, and Certificate of Occupancy:
   1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

J. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

K. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.

L. Coordinate all testing of fire alarm monitoring of sprinkler tamper waterflow and pressure switches with the Plumbing/Fire Protection Contractor.

M. Coordinate all testing of fire/smoke damper closure, with Mechanical Contractor.

N. Coordinate all testing of door holder release with the General Contractor.

O. Coordinate testing of fire alarm monitoring of kitchen hood suppression system with responsible contractors.

P. Coordinate fire alarm testing of elevator recall smoke detection with elevator contractor.

3.3 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.4 OWNER PERSONNEL INSTRUCTION

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below:
   1. Basic Operation: Eight-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
      a. Schedule, in writing, training with Owner at least seven days in advanced.
      b. Initial Training: 1 session pre-closeout.
   2. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
      a. Initial Training: 1 session pre-closeout.

3.5 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

3.6 MAINTENANCE

A. Execution Requirements: Furnish service and maintenance of the system components for one year from the Date of Substantial Completion. This shall include all recommended and required preventative maintenance inspections/testing as outlined by the manufacturer and repairs to manufacturer or installer defects. All of this shall be provided at no charge to the Owner. Contractor at the completion of work shall submit to the Owner and Owners Representative a schedule indicating when inspections/testing will be conducted and an outline indicating what inspections/testing will be conducted on the system during the course of the warranty period.

B. All system service calls during the warranty period shall be handled in the following manner:
   1. Owner shall contact the Electrical Contractor and initiate a service call who in turn shall contact the equipment vendor to respond and investigate the source of the service call.
   2. If the equipment vendor establishes that the source of the service call is related to the electrical installation, the equipment vendor shall contact the Electrical Contractor for warranty service.
   3. The Owner shall not be responsible for any charges during the warranty period that result in the Owner notifying the installing contractor of a defect in the system.
   4. During construction and warranty period there shall be a required one hour phone response and a four hour on site response by a qualified technician time limit. All response outside of this service is in breach of contract.

3.7 WARRANTY

A. Call back response time shall be 24 hours 7 days a week.

B. On-site response time shall be 24 hours 7 days a week.

END OF SECTION

SECTION 285240
SECURITY COMMUNICATIONS EMERGENCY PHONE SYSTEM

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 01 - General Requirements and Division 28, Section 28 00 00 shall be considered a part of this section and shall have the same force as if printed herein full.

B. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment, and tools required for the complete installation of the work indicated on the Drawings, as specified herein, or as noted in other sections of Division 28 - Electronic Safety and Security.

C. All materials, obviously a part of the electronic security infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished and installed without additional charge.

D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawings and Specifications, the higher level of functionality shall be included to meet the design intent.

1.2 RELATED SECTIONS

A. 28 00 00 Electronic Safety and Security

1.3 WORK INCLUDED

A. The Work shall include installation and commissioning of the following:
   1. Integrated Security Management system consisting of:
      a. Intercom Communications Emergency Phone System
   2. Wire and cable to install all equipment as specified herein
   3. Miscellaneous conduit and back boxes (not shown on the Documents as provided, but required for a complete installation)
   4. The contractor is to furnish all of the required signage for the Emergency Phone location per 1007.6.3 Two-way Telecommunication systems.

1.4 GENERAL SYSTEM DESCRIPTION

A. The purpose of the Intercom System shall be to provide voice communication through emergency phones.

B. B. This Section includes the following:
   1. Emergency security phones in weatherproof enclosure with blue light strobe for identification.
   2. Outlet boxes, conduit, wiring, and all other equipment necessary to provide a complete and operating emergency phone system.
   3. Equipment furnished under the terms of this specification shall be the standard product of a single manufacturer.

C. SUBMITTALS
   1. Product Data: For each type of product indicated.
   2. Wiring diagrams showing typical field wiring connections.
   3. Operation and maintenance data.
   4. As-built drawings that include any changes to wiring, wiring designations, junction box labeling and any other pertinent information shall be supplied upon completion of project.

D. QUALITY ASSURANCE

1. The Contractor shall be from an established business which has been operating in the area for a minimum of five years.
2. The Contractor shall show evidence that he maintains a service organization and parts inventory to adequately support the supplied equipment.
3. The Contractor shall provide a one year guarantee of the installed system against defects in material and workmanship. All contractor labor and materials shall be provided at no expense to the Owner. Guarantee period shall begin on the date of acceptance by the Owner or Site Representative.
4. The System Manufacturer shall warrantee the installed system's components against defects in material and manufacturer's workmanship for a period of one year from date of acceptance by the Owner or Site Representative. Replacement or repair of system components only (job-site labor not included) shall be at the Manufacturer's discretion and provided at no expense to the Owner.
5. The supplying Contractor shall have attended the Manufacturer's installation and service school or have been authorized by the Manufacturer to install the equipment.

PART 2 PRODUCTS

2.1 KEYPAD EMERGENCY PHONE

A. Outdoor-rated, ADA-compliant hands-free Emergency Phone with Keypad.
   1. 12 gauge (2.8mm) #4 brushed stainless steel face plate.
   2. Operating Temperature: -4 degrees F to +149 degrees F (-20 degrees C to +65 degrees C).
   3. Mounting: Flush mounts (surface mount options available), for flush mount provide MS-600 flush mounting sleeve.
   4. Communication: 2-way hands-free communication.
   5. Digit Capacity: Up to 18 digits, including pauses, for each of two phone numbers (top button).
   6. Dialing Speed: Approximately 10 tones per second.
   7. Power Source: Phone line powered (requires 20mA at 24 v off-hook.
   8. Connection: CAT 6 connection installed to the local IDF and conforming to the specifications as all other CAT 6 cables.
   9. Circuit Protection: Varistor lightening suppressed and full wave polarity guarded.
   10. Programming: Non-volatile EEPROM programming can be done from any telephone.
   11. "On Time": Programmable from 1-4270 minutes in 1 minute increments.
   12. Wiring Requirements: 1 twisted-shielded pair.
   13. Compliance: CSA Certified to UL Standard 60950.
      a. Keypad can be used to make calls to numbers authorized by you.
      b. Cast metal raised letter and Braille signage for ADA compliance.
      c. Vandal resistant stainless steel faceplate and metal button.
      d. PoE powered: no power supply or battery back-up needed.
      e. Circuit boards are conformally coated for water protection.
      f. LED indicator for hearing impaired.
      g. Auxiliary input and outputs to integrate with CCTV, Blue Light Strobe, Scream Alert and other devices.
      h. Built-in auto-dialer can dial two numbers: if first number doesn't answer or is busy, dials second number.
      i. Auto-answer allows security to monitor and initiate calls with Emergency Phone.
      j. Talk a phone VOIP-600ECK

2.2 HOODED SURFACE MOUNT ACCESSORY

A. General Description
   1. The unit shall be a highly vandal-resistant stainless steel emergency phone Hooded Surface Mount Accessary, model ETP-SMH or ETP-SMH-1, no substitutions, suitable for mounting on an outdoor wall or poll. The Surface Mount shall house an ADA-compliant, line-powered communication device manufactured by Talk-A-Phone Co. Externally-poered devices are not acceptable.

B. Construction
   1. The unit shall be constructed of stainless steel and weight approximately 7 lbs.
   2. The unit shall measure 10.50" W x 12.75" H x 6.5" D (Top) x 5.0" D (Bottom).
   3. The unit shall be painted in Safety Yellow with "EMERGENCY" emblazoned on both sides in reflective black vinyl letters. Custom wording and colors shall be available.
   4. The unit shall be designed such that any 600-Series flush mounting Emergency Phone shall recess mount into Hooded Surface Mount Accessory.
   5. The unit shall have 7/8" conduit entry holes on back and bottom (or optionally on top).

C. Mounting
   1. The Hooded Surface Mount shall have four 0.34" holes on the back wall for surface mounting on a wall or strapping to a poll.
   2. Poll Mounting Kit, model ETP-PMKT, shall be available for strapping to a poll.

D. Compliance
   1. CSA Certified to UL Standard 60950

E. Warranty
   1. Equipment shall be warrantied against any defects in material and workmanship, under normal use, for a period of one year from date of installation. In the event system is found by manufacturer to be defective within the warranty period, manufacturer shall repair and/or replace any defective parts, provided the equipment is returned to manufacturer.
   2. Execution Requirements: Furnish service and maintenance of the system components for one year from the Date of Substantial Completion. This shall include all recommended and required preventative maintenance inspections/testing as outlined by the manufacturer and repairs to manufacturer or installer defects. All of this shall be provided at no charge to the Owner. Contractor at the completion of work shall submit to the Owner and Owners Representative a schedule indicating when inspections/testing will be conducted and an outline indicating what inspections/testing will be conducted on the system during the course of the warranty period.
   3. All system service calls during the warranty period shall be handled in the following manner:
      a. Owner shall contact the Electrical Contractor and initiate a service call who in turn shall contact the equipment vendor to respond and investigate the source of the service call.
      b. If the equipment vendor establishes that the source of the service call is related to the electrical installation, the equipment vendor shall contact the Electrical Contractor for warranty service.
      c. The Owner shall not be responsible for any charges during the warranty period that result in the Owner notifying the installing contractor of a defect in the system.

d. During construction and warranty period there shall be a required one hour phone response and a four hour on site response by a qualified technician time limit. All response outside of this service is in breach of contract.

F. Manufacturer
1. The Manufacturer shall be Talk-A-Phone Co. (773) 539-1100, 7530 N. Natchez Ave, Niles, Illinois 60714-3804, www.talkaphone.com. THERE ARE NO EQUIVALENTS.

2.3 EMERGENCY PHONE TOWER ARCHITECTURAL & ENGINEERING SPECIFICATION

A. General Description
1. Owner shall contact the Electrical Contractor and initiate a service call who in turn shall contact the equipment vendor to respond and investigate the source of the service call.
2. If the equipment vendor establishes that the source of the service call is related to the electrical installation, the equipment vendor shall contact the Electrical Contractor for warranty service.
3. The Owner shall not be responsible for any charges during the warranty period that result in the Owner notifying the installing contractor of a defect in the system.
4. During construction and warranty period there shall be a required one hour phone response and a four hour on site response by a qualified technician time limit. All response outside of this service is in breach of contract.
5. The unit shall be a highly vandal-resistant free-standing steel emergency phone tower mount, model SUNY-NP-001, a flashing LED blue light and a lighted faceplate. The tower shall house an ADA-compliant communication device manufactured by Talk-A-Phone Co.
6. The LED blue light shall be continuously lit and shall flash for the duration of a call when emergency button is pressed on the communication device. The communication device shall be capable of activating optional peripheral devices (i.e. activating a preset on a PTZ dome camera).
7. May require a pair of wires from Emergency Phone to trigger blue light strobe. Install as per manufactures instructions

B. Construction
1. The unit shall be constructed of 0.25" thick steel and weigh approximately 385 lbs.
2. The tower shall measure 12" W x 10" D x 108" H with a 2" radius on each corner. Including the extension arm, the tower shall be 12" W x 19" D x 167" H.
3. A multi-coat, rust-inhibitive coating shall be applied to withstand prolonged exposure to harsh environments.
4. An internal base plate shall be fully welded within the tower 2" above the tower base. The base plate shall be fabricated of 0.75" A-36 steel. There shall be a 4" diameter center hole for wiring access and four 1" diameter holes for anchor bolt clearance.
5. Tower shall have a wiring access opening measuring 9" H x 6.75" W, located 15" above the base of the tower. The opening shall have a flush cover plate with a wall thickness of 0.25", held in place by two 10-24 countersunk, tamper-resistant spanner screws.
6. Tower shall have a 2" wire opening surrounded by four pre-drilled holes for mounting the extension arm.
7. An opening shall be cut in the front of the tower for flush-mounting any 400-series or 600-series Talk-A-Phone emergency phone. The lower edge of the opening shall slope down 30° from rear to front, making the edge difficult to use as a shelf yet convenient as a writing surface.

8. The word "EMERGENCY" shall be emblazoned on all four sides in 3.25" high reflective white letters (custom lettering, sizes and colors available).

C. Lighting
   1. Atop the tower shall be a flashing LED blue light.
      a. The blue light shall be a 7.8 watt high efficiency, all-LED construction light. The unit shall retain 70% of its initial lumens after 50,000 hours of operation. The unit shall be lit at all times.
      b. The blue light shall have a rating of 209 lumens (peak) and automatically flash 78 times per minute when the emergency phone call is placed and continue flashing until the call has been completed.
      c. The polycarbonate refractor/housing shall have a prismatic pattern to increase visibility at greater distances.
   2. The unit shall have a concealed ultra-bright LED assembly to illuminate the emergency phone faceplate at all times. LEDs shall have a lifetime of 100,000 hours.

D. Electrical
   1. When in use with an ETP-400 Series emergency phone, the communication device shall require no external power. It shall be powered by the phone line or a PBX extension.
   2. When in use with a VOIP-600 Series emergency phone, the communication device shall require 12VDC, 24VDC/AC, or Power over Ethernet (PoE).
   3. The light shall require 96-132VAC standard. The low voltage version shall require 10-30VDC / 20-28VAC.
   4. All lamps and fixtures shall be UL, ETL, C.S.A. listed. All electrical components shall be hard wired and concealed within the tower. All wiring and electrical fixtures comply with the standards of the National Electrical Code, UL and C.S.A.

E. Mounting
   1. The tower shall include 24 inch J-bolts for mounting into a 24" x 24" concrete foundation, depth to vary according to local regulations and other site-specific considerations. J-bolts shall protrude approximately 5 inches from the surface of the foundation.
   2. The extension arm shall mount to the top back of the tower by fitting bolts through pre-drilled holes in the tower.
   3. An optional mounting kit, model ETP-PDMK-4, shall be available for mounting into above the ground locations such as parking decks, where access to a concrete base is available from both above and below.

F. Options
   1. Communications
      a. Tower shall accept Talk-A-Phone VOIP-600ECK flush mounting emergency phone.
   2. Integrated CCTV
      a. Model SUNY-NP-001

G. Compliance
   1. Tower shall be certified to UL Standard 60950.

H. Warranty
   1. Tower shall be warrantied against any defects in material and workmanship, under normal use, for a period of five years from date of installation. In the event system is found by manufacturer to be defective within the warranty period, manufacturer shall repair and/or replace any defective parts, provided the equipment is returned to manufacturer.

I. Manufacturer
   1. The Manufacturer shall be Talk-A-Phone Co. (773) 539-1100, 7530 N. Natchez Ave, Niles, Illinois 60714-3804, www.talkaphone.com. THERE ARE NO EQUIVALENTS.

PART 3 EXECUTION

3.1 INSTALLATION

A. Shall be installed by qualified technicians who have been factory trained and certified by the manufacturer.

B. Wiring shall be uniform and in accordance with national electric codes and manufacturers' instructions.

C. Equipment shall be firmly secured, plumb, and level.

D. All splices shall be in easily accessible junction boxes or on terminal boards.

E. All cable runs at the main terminal board and in all junction boxes shall be tagged and identified.

F. Coordinate all work with other effected trades and contractors.

G. Emergency phone to be mounted at 48.75" AFF to center of phone.

3.2 SYSTEM STARTUP

A. Power shall only be applied to the system after re-checking for proper grounding of the system and measuring all loops for lack of shorts, grounds, and open circuits.

B. B. Complete system shall be installed in strict accordance with manufacturer's written instructions.

C. Wiring:
   1. Concealed:
      a. All wiring in areas of new construction shall be concealed in walls, ceilings, etc.
      b. All wiring in existing areas shall be concealed in walls and ceilings where practicable.
      c. All wiring shall be installed in raceways.

3.3 INSPECTION AND TEST UPON COMPLETION

A. System field wiring diagrams shall be provided to the Contractor by the system Manufacturer prior to installation.

B. Upon completion of the installation:
   1. Four (4) copies of complete operational instructions shall be furnished, complete with record drawings. Instructions shall include part numbers and name, address, and telephone number of parts source.
   2. Contractor shall provide to the Engineer a signed statement that the system has been wired and tested, and functions properly according to the specifications.

C. Nothing herein contained shall be construed to relieve the Contractor from furnishing a complete and acceptable electrical wiring system in all its categories. The Engineer will reject any materials or labor which are or may become detrimental to the accomplishment of the intentions of these specifications.

3.4 COMMISSIONING

A. After all Work is completed, and prior to requesting the Acceptance test, Contractor shall conduct a final inspection, and pre-test all equipment and system features. Contractor shall correct any deficiencies discovered as the result of the inspection and pre-test.

B. Contractor shall submit a request for the Acceptance test in writing to the SUNY New Paltz Project Manager, no less than fourteen days prior to the requested test date. The request for Acceptance test shall be accompanied by a certification from Contractor that all Work is complete and has been pre-tested, and that all corrections have been made.

C. During Acceptance test, Contractor shall demonstrate all equipment and system features to SUNY New Paltz. Contractor shall remove covers, open wiring connections, operate equipment, and perform other reasonable work as requested by SUNY New Paltz.

D. Any portions of the Work found to be deficient or not in compliance with the Project Drawing and Specifications will be rejected. SUNY New Paltz Project Manager will prepare a list of any such deficiencies observed during the Acceptance test. Contractor shall promptly correct all deficiencies. Upon correction of deficiencies, Contractor shall a request in writing to SUNY New Paltz Project Manager for another Acceptance Test.

E. If, at the conclusion of the Acceptance Test, all Work is found to be acceptable and in compliance with the Project Drawings and Specifications, SUNY New Paltz Project Manager will issue a letter of Acceptance to Contractor and SUNY New Paltz.

3.5 INITIAL PROGRAMMING AND CONFIGURATION

A. System shall include all software necessary for system configuration.

B. Contractor shall provide initial programming and configuration of the security communication system. Input of all program data shall be by Contractor. Contractor shall consult with Security Consultant and Owner to determine operating parameters.

C. System shall be turned on and adjustments made to meet requirements of specifications and on-site conditions.

D. System shall be programmed to function as specified.

E. Directory numbers, feature codes, and special programming shall be documented, printed, and made available to owner.

F. Intercom license installed at SMS Server and intercom units programmed in SMS.

G. Owner shall provide floor plan drawings, in the form of AutoCAD .DWG or .DXF files, as the basis for the creation of maps.

H. Contractor shall maintain hard copy worksheets which fully document the system program and configuration. Worksheets shall be kept up to date on a daily basis by Contractor until final Acceptance by Owner. Worksheets shall be subject to inspection and approval by Owner. Provide final copies to Owner prior to Project Close-out.

I. Contractor shall maintain a complete, up-to-date backup of the system configuration and cardholder database. Backup shall be maintained throughout programming period until final Acceptance by Owner. Submit back-up files to Owner upon Final Acceptance.

3.6 TRAINING

A. Contractor shall provide complete operator training on the Security Communications System including integration to the Security Management System. Training shall consist of 4 hours of classroom instruction for six (6) people selected by Owner, plus one (1) hour of individual hands-on training for each of six (6) people selected by Owner. Handson training shall include the opportunity for each person to operate the system, and to practice each operation that an operator would be expected to perform.

B. Training shall cover all operating features of the system.

1. Making and responding to call requests
2. Other SMS integration features
3. Routine maintenance and adjustment procedures

C. Training sessions are to be held at Owner's facility, and are to be scheduled at the convenience of Owner. Contractor shall provide written training outline and agenda for each training session prior to scheduling.

D. Contractor shall provide written training materials for each of six (6) people.

3.7 **WARRANTY**

A. Call back response time shall be 24 hours 7 days a week.

B. On-site response time shall be 24 hours 7 days a week.

END OF SECTION

SECTION 310000
EARTHWORK

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Topsoil: Section 329120.

B. Seeding: Section 329219.

1.2 DEFINITIONS

A. The following terms shall have the meanings ascribed to them in this Article, wherever they appear in this Section.
   1. Earth Excavation: The removal of all surface and subsurface material not classified as rock (as defined below).
   2. Rock: Limestone, sandstone, shale, granite, and similar material in solid beds or masses in its original or stratified position which can be removed only by blasting operations, drilling, wedging, or use of pneumatic tools, and boulders with a volume greater than 1.0 cu yd. Concrete building foundations and concrete slabs, not indicated, with a volume greater than 1.0 cu yd shall be classified as rock.
      a. Limestone, sandstone, shale, granite, and similar material in a broken or weathered condition which can be removed with an excavator or backhoe equipped with a bucket with ripping teeth or any other style bucket shall be classified as earth excavation.
      b. Masonry building foundations, whether indicated or not, shall be classified as earth excavation.
   3. Subgrade Surface: Surface upon which subbase or topsoil is placed.
   4. Subbase: Select granular material, blend 57 stone or subbase course Type 2 which is placed immediately beneath pavement or concrete slabs.
   5. Foundation Bearing Grade: Grade/elevation at which the bottom-of-footings are constructed.
   6. Maximum Density: The dry unit weight in pounds per cubic foot of the soil at "Optimum Moisture Content" when determined by ASTM D 1557 (Modified Proctor).
   7. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
   8. Landscaped Areas: Areas not covered by structures, walks, roads, paving, or parking.
   9. Unauthorized Excavation: The removal of material below required elevation indicated on the Drawings or beyond lateral dimensions indicated or specified without specific written direction by the Owner's Representative.
   10. Grading Limit Line (Shown on Drawings): Limits of grading, excavations and filling required for the work of this contract.

Unless specifically noted otherwise, the Grading Limit Line and Contract Limit Line shall be considered the same.

1.3 SUBMITTALS

A. Product Data:
   1. Filter Fabric: Manufacturer's catalog sheets, specifications, and installation instructions.

B. Samples: Submit samples as follows. Take the samples in the presence of the Owner's Representative, and submit to the Owners Representative the laboratory test results for gradation, proctors and soundness tests, when required. These tests shall be performed in accordance with ASTM standards, shall be performed and signed by a certified soils laboratory, and shall be submitted as part of the original submittal. At a minimum the samples taken shall be of the following quantities:
   1. Select Granular Material: 50 - 60 lb. (Two Samples).
   2. Subbase Course Type 2: 50 - 60 lb. (Two Samples).
   3. Selected Fill: 40 - 50 lb.
   4. Crushed Stone: 30 lb

C. Quality Control Submittals:
   1. Excavation Procedure: Submit a lay out drawing or detailed outline of intended excavation procedure for the Owner's information. This submittal will not relieve the Contractor of responsibility for the successful performance of intended excavation methods.
   2. Subbase Materials: Name and location of source and the DOT Source Number. If the material is not being taken from an approved DOT Source the results of the gradation and soundness tests performed by an ASTM certified soils laboratory will be required.
   3. Other Aggregates: Name and location of source and soil laboratory test results.

1.4 PROJECT CONDITIONS

A. Protect existing trees and plants during performance of the Work unless otherwise indicated. Box trees and plants indicated to remain within the grading limit line with temporary steel fencing or solidly constructed wood barricades as required. Protect root systems from smothering. Do not store excavated material, or allow vehicular traffic or parking within the branch drip line. Restrict foot traffic to prevent excessive compaction of soil over root systems.

B. Cold Weather Requirements:
   1. Excavation: When freezing temperatures are anticipated, do not excavate to final required elevations for concrete work unless concrete can be placed immediately.
   2. Backfilling: If backfill is being placed during freezing temperatures the backfilling operations shall be monitored by the Owner's Representative and the following procedures shall be followed:

a. Frozen ground shall be removed in its entirety from beneath and five feet beyond the area of fill placement.
b. The fill material placed shall consist of Selected Fill and shall be free of all frozen chunks that exceed four inches in size. The material transported to the project site shall only consist of material excavated from below the frost depth.
c. At the end of the work day, the area of fill placement shall be covered with insulated blankets, or left unprotected. Other means of protection (hay, wood chips, etc.) may also be used for protection provided it is approved by the Owner's Representative.
d. Following work day, remove the insulated blankets and/or strip the area of all frozen material as specified previously.
e. Upon establishing the subgrade elevations, protect the grades with insulated blankets or place additional material that will adequately insulate the exposed earth surface from frost. This additional fill or protective material shall be stripped just prior to pouring concrete.

PART 2 PRODUCTS

2.1 MATERIALS

A. Select Granular Material: Stockpiled, sound, durable, sand, gravel, stone, or blends of these materials, free from organic and other deleterious materials. Comply with the gradation and material requirements specified below:

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
2 inch	50.8	100
1/4 inch	6.35	30-65
No. 40	0.425	5-40
No. 200	0.075	0-10

1. Magnesium Sulfate Soundness Test: 20 percent maximum loss by weight after four test cycles.
2. Plasticity Index: The plasticity index of the material passing the No. 40 mesh sieve shall not exceed 5.0.
3. Elongated Particles: Not more than 30 percent, by weight, of the particles retained on a 1/2 inch sieve shall consist of flat or elongated particles. A flat or elongated particle is defined as one which has its greatest dimension more than three times its least dimension.

B. Subbase Course Type 2: Stockpiled, crushed ledge rock or approved blast furnace slag. Comply with the gradation and material requirements specified below:

Sieve		Percent Passing
Sieve Size	Size opening (mm)	

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
2 inch	50.8	100
1/4 inch	6.35	25-60
No. 40	0.425	5-40
No. 200	0.075	0-10

1. Magnesium Sulfate Soundness Test: 20 percent maximum loss by weight after four test cycles.
2. Plasticity Index: The plasticity index of the material passing the No. 40 mesh sieve shall not exceed 5.0.
3. Elongated Particles: Not more than 30 percent, by weight, of the particles retained on a 1/2 inch sieve shall consist of flat or elongated particles. A flat or elongated particle is defined as one which has its greatest dimension more than three times its least dimension.

C. Select Fill: Sound, durable, sand, gravel, stone, or blends of these materials, free from organic and other deleterious materials. Comply with the gradation requirements specified below:

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
4 inch	101.6	100
No. 40	0.425	0-70
No. 200	0.075	0-15

D. Suitable Material (Fill and Backfill for Landscaped Areas): Material consisting of mineral soil (inorganic), blasted or broken rock and similar materials of natural or man-made origin, including mixtures thereof. Maximum particle size shall not exceed 2/3 of the specified layer thickness prior to compaction. NOTE: Material containing cinders, industrial waste, sludge, building rubble, land fill, muck, and peat shall be considered unsuitable for fill and backfill, except topsoil and organic silt may be used as suitable material in landscaped areas provided it is placed in the top layer of the subgrade surface.

E. Rip Rap: Fine, Light, Medium or Heavy Stone Filling that complies with DOT Article 620-2.02 for stone filling.

F. Drainage Stone: ¾" washed crushed stone. Material size ranges from ¾" to a No. 4 sieve.

G. Item B-12: Equal Blend of No.1 and No. 2 Crushed Stone that complies with material requirements of DOT Article 703-02, crushed stone only.

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
1-1/2 inch	38.1	100
1 inch	25.4	95-100
½ inch	12.7	45-60

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
¼ inch	6.35	0-15

H. No. 1 Coarse Aggregate: Crushed Stone that complies with material requirements of DOT Article 703-02 and meets the following gradation.

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
1 inch	25.4	100
1/2 inch	12.7	90-100
1/4 inch	6.35	0-15

I. No. 2 Coarse Aggregate: Crushed Stone that complies with material requirements of DOT Article 703-02 and meets the following gradation.

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
1-1/2 inch	38.1	100
1 inch	25.4	90-100
1/2 inch	12.7	0-15

J. Structural Fill: Well graded bank-run sand and gravel and meets the following gradation.

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
3"	75	100
No. 40	0.425	30-70
No. 200	0.075	0-15

K. Blend #57: Open-graded crushed stone meeting the following gradation.

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
1-1/2 inch	38.1	100
1 inch	25.4	95-100
1/2 inch	12.7	25-60
No. 4	4.75	0-10
No. 8	2.36	0-5

K. Marker Tape: FL Industries Blackburn/Holub's Type YT6, or Seton Nameplate Corporations Type 6 ELE, imprinted with message suited to item buried below.

2.2 GEOTECHNICAL FABRICS

A. Filter Fabric (GeoTextile)
1. Drainage and Erosion Control: Amoco 1199 & 2019, Mirafi 160N, Thrace-Linq 150EX, Propex Geotex 601 or equivalent.

2. Separation/Stabilization beneath pavements: Mirafi 500X, Thrace-Linq GTF200, Propex Getoex 200ST or equivalent.

2.03 BRICK AND MORTAR

A. Manhole Brick: Standard size, ASTM C 32, Grade MS.

B. Mortar Materials: Dry packaged, proportioned for Type M unit masonry mortar, complying with ASTM C 387.

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

A. Clear and grub the site within the Grading Limit Line (GLL) of trees, shrubs, brush, other prominent vegetation, debris, and obstructions except for those items indicated to remain. Completely remove stumps and roots protruding through the ground surface.

B. Fill depressions caused by the clearing and grubbing operations in accordance with the requirements for filling and backfilling, unless further excavation is indicated.

3.2 UNDERGROUND UTILITIES

A. Locate existing underground utilities prior to commencing excavation work. Determine exact utility locations by hand excavated test pits. Support and protect utilities to remain in place.

B. Do not interrupt existing utilities that are in service until temporary or new utilities are installed and operational.

C. Utilities to remain in service: Shall be re-routed as shown on the Contract Drawings.

D. Utilities abandoned beneath and five feet laterally beyond the structure's proposed footprint shall be removed in their entirety. Excavations required for their removal shall be backfilled and compacted as specified herein.

E. Utilities located outside the limits specified above may be abandoned in place provided their ends are adequately plugged as described below.
1. Permanently close open ends of abandoned underground utilities exposed by excavations, which extend outside the limits of the area to be excavated.
2. Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs or other approved method for the type of material and size of pipe. Do not use wood plugs.
3. Close open ends of concrete and masonry utilities with concrete or flow-able fill.

3.3 EXCAVATION

A. Excavate earth as required for the Work.

B. Install and maintain all erosion and sedimentation controls during all earthwork operations as specified on the Contract Drawings or as directed by local officials. If the erosion and sedimentation controls specified by the local officials are more stringent than those specified on the Contract Drawings contact the Owner's Representative.

C. Maintain sides and slopes of excavations in a safe condition until completion of backfilling. Comply with Code of Federal Regulations Title 29 - Labor, Part 1926 (OSHA).
   1. Trenches: Deposit excavated material on one side of trench only. Trim banks of excavated material to prevent cave-ins and prevent material from falling or sliding into trench. Keep a clear footway between excavated material and trench edge. Maintain areas to allow free drainage of surface water.

D. Stockpile excavated materials classified as suitable material where directed, until required for fill. Place, grade, and shape stockpiles for proper drainage as approved by the Owner's Representative.

E. Excavation for Structures: Conform to elevations, lines, and limits indicated. Excavate to a vertical tolerance of plus or minus 1 inch. Extend excavation a sufficient lateral distance to provide clearance to execute the Work.

F. Pipe Trenches and/or Bell and Spigot Pipe Trenches: Open only enough trench length to facilitate laying pipe sections. Unless otherwise indicated on the Drawings, excavate trenches approximately 24 inches wide plus the outside pipe diameter, equally divided on each side of pipe centerline. Cut trenches to cross section, elevation, profile, line, and grade indicated. Accurately grade and shape trench bottom for uniform bearing of pipe.
   1. Trench in Rock: Excavate an additional 6 inches below bottom of pipe for bed of cushion material under the piping.

G. Conduit, Cable, Tubing and Piping (other than Bell and Spigot): Provide sufficient trench width for installation and to accommodate special backfill when specified.

H. Open Ditches: Cut ditches to cross sections and grades indicated.

I. Pavement: Excavate to subgrade surface elevation.

J. Unauthorized Excavations: Unless otherwise directed, backfill unauthorized excavation under footings, foundation bases, and retaining walls with compacted select granular material without altering the required footing elevation. Elsewhere, backfill and compact unauthorized excavation as specified for authorized excavation of the same classification, unless otherwise directed by the Owner.

1. Unauthorized excavations under structural Work such as footings, foundation bases, and retaining walls shall be reported immediately to the Owner before any concrete or backfilling Work commences.

K. Notify the Owner's Representative upon completion of excavation operations. Do not proceed with the Work until the excavation is inspected and approved. Inspection of the excavation by the Owner's Site Representative will be made on 3 working days notice.

3.4 DEWATERING

A. Prevent surface and subsurface water from flowing into excavations and trenches and from flooding the site and surrounding area.

B. Do not allow water to accumulate in excavations or trenches. Remove water from all excavations immediately to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to the stability of subgrades and foundations. Furnish and maintain pumps, sumps, suction and discharge piping systems, and other system components necessary to convey the water away from the Site.

C. Convey water removed from excavations, and rain water, to collecting or run-off area. Cut and maintain temporary drainage ditches and provide other necessary diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

D. Provide temporary controls to restrict the velocity of discharged water as necessary to prevent erosion and siltation of receiving areas.

3.5 PLACING FILTER FABRIC

A. Place and overlap filter fabric in accordance with the manufacturer's installation instructions, unless otherwise shown.

B. Cover tears and other damaged areas with additional filter fabric layer extending 3 feet beyond the damage.

C. Do not permit traffic or construction equipment directly on filter fabric.

D. Backfill over filter fabric within two weeks after placement. Backfill in accordance with the fabric manufacturer's instructions and in a manner to prevent damage to the fabric.

3.6 PLACING FILL AND BACKFILL

A. Surface Preparation of Fill Areas: Strip topsoil, remaining vegetation, and other deleterious materials prior to placement of fill. Remove all asphalt pavement in its entirety from areas requiring the placement of fill or break up old pavements to a maximum size of four inches. Prior to placement of fill, smooth out and compact areas where wheel rutting has occurred due to stripping or earthwork operations.

B. Excavations: Backfill as promptly as practicable, but only after approval by the Owner's Representative. Do not backfill with excavated material unless it meets the requirements of this Section.

C. Place backfill and fill materials in layers not more than 8 inches thick in loose depth unless otherwise specified. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or covered with ice.
   1. Place fill and backfill against foundation walls, and in confined areas (such as trenches) not easily accessible by larger compaction equipment, in maximum six inch thick (loose depth) layers.
   2. For Open Graded Stone/Clean Stone (Item B-12, No. 1 crushed stone, No. 2 crushed stone, etc.) in access of six inches: Material must be wrapped in separation fabric.

D. Prevent wedging action of backfill against structures by placing backfill uniformly around structure to approximately same elevation in each layer. Place backfill against walls of structures containing basements or crawl spaces only after the first floor structural members are in place.

E. Under Pavements and Walks:
   1. Up to Subgrade Surface Elevation: Place selected fill when fill or backfill is required.
   2. Subbase Material: Place as indicated.

F. Landscaped Areas: Place suitable material when required to complete fill or backfill areas up to subgrade surface elevation. Do not use material containing rocks over four inches in diameter within the top 12 inches of suitable material.

G. Plastic Pipe in Trenches: Place select granular material a minimum of six inches deep under pipe, 12 inches on both sides, and 12 inches above top of pipe. Complete balance of backfill as specified.

H. Copper Tubing and Steel Gas Pipe in Trenches: Place cushion material a minimum of six inches deep under pipe, six inches on both sides, and 4 inches over top of pipe. Complete balance of backfill as specified.

3.7 COMPACTION

A. All materials with exception of open graded stone (No. 2 Coarse aggregate, No. 1 Coarse aggregate, Item B-12, etc.):
   1. Compact each layer of fill and backfill for the following area classifications to the percentage of maximum density specified below and at a moisture content suitable to obtain the required densities, but at not less than three percent drier or more than two percent wetter than the optimum content as determined by ASTM D 698 (Standard Proctor) or 1557 (Modified Proctor).

a. Structures (entire area within ten feet outside perimeter): 95 percent.
b. Concrete Slabs and Steps: 95 percent.
c. Landscaped Areas: 90 percent.
d. Pavements and Walks: 95 percent.
e. Pipes and Tunnels: 95 percent.
f. Pipe Bedding: 95 percent.

2. If a compacted layer fails to meet the specified percentage of maximum density, the layer will be re-compacted and retested. If compaction cannot be achieved the material/layer will be removed and replaced. No additional material may be placed over a compacted layer until the specified density is achieved

B. Open graded Stone: Place material in maximum twelve inch lifts. Each lift shall be raked smooth and compacted through several passes of a walk behind vibratory roller. Compaction Testing is not required.

3.8 GRADING

A. Rough Grading: Trim and grade area within the Grading Limit Line and excavations outside the limit line, required by this Contract, to a level of four inches below the finish grades indicated unless otherwise specified herein or where greater depths are indicated. Provide smooth uniform transition to adjacent areas.

B. Finish Grading: Finish surfaces free from irregular surface changes, and as follows:
1. Grassed Areas: Finish areas to receive topsoil to within 1 inch above or below the required subgrade surface elevations.
2. Walks and Pavements: Place and compact subbase material as specified. Shape surface of areas to required line, grade and cross section, with the finish surface not more than 1/2 inch above or below the required subbase elevation.
3. Building Slabs: Grade subbase material smooth and even, free of voids, compacted as specified to within 1/4 inch above or below required subbase elevation.

3.9 RESTORATION

A. Restore pavements, walks, curbs, lawns, and other exterior surfaces damaged during performance of the Work to match the appearance and performance of existing corresponding surfaces as closely as practicable.

B. Topsoil and seed or sod damaged lawn areas outside the GLL and new lawn areas inside the GLL. Water as required until physical completion of the Work.

3.10 DISPOSAL OF EXCESS AND UNSUITABLE MATERIALS

A. Remove from State property and dispose of excess and unsuitable materials, including materials resulting from clearing and grubbing and removal of existing improvements.

3.11 FIELD QUALITY CONTROL

A. Compaction Testing: Notify the Owner's Representative at least 3 working days in advance of all phases of filling and backfilling operations. Compaction testing will be performed by the Owner's Representative to ascertain the compacted density of the fill and backfill materials. Compaction testing will be performed on certain layers of the fill and backfill as determined by the Owner's Representative. If a compacted layer fails to meet the specified percentage of maximum density, the layer shall be re-compacted and will be retested. No additional material may be placed over a compacted layer until the specified density is achieved.

3.12 PROTECTION

A. Protect graded areas from traffic and erosion, and keep them free of trash and debris.

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SECTION 311300
SELECTIVE TREE REMOVAL AND TRIMMING

PART 1 GENERAL

1.1 DESCRIPTION

A. Company Qualifications: The Company performing the Work of this section shall be insured and have a minimum of five (5) years of experience in tree removal and trimming. The person supervising the Work shall also have a minimum of five (5) years of experience in tree removal and trimming.

B. The work shall consist of the removal and disposal of selected trees including stumps and roots.

1.2 SUBMITTALS

A. Submit detailed experience and qualifications description of tree trimming and removal. Experience and qualifications package should include a description of the types of equipment and experience that can be provided.

1.3 COORDINATION AND SCHEDULING

A. Coordinate work with the Owner's representative to minimize disruptions and facility operations. The Owner's Representative shall be notified at least three (3) working days prior to performing the work and should be provided a schedule for the works progression.

1.4 PROJECT CONDITIONS

A. Protect existing trees and plants during performance of the Work unless otherwise indicated. Box trees and plants indicated to remain within the grading limit line with temporary orange construction fencing or solidly constructed wood barricades as required. Protect root systems from smothering. Do not store excavated material or allow vehicular traffic or parking within the canopy drip line. Restrict foot traffic to prevent excessive compaction of soil over root systems.

B. Review NYS DEC quarantine order for the districts and the regulations of the movement of materials.
http://www.dec.ny.gov/docs/lands_forests_pdf/eab2013quarorder.pdf

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 PREPARATION

A. Protection:

1. Prevent damage to buildings, pavement, pipes, conduits, poles and other structures above and below ground that are adjoining or included in the contract area. Repair damage resulting from the contractor's negligence.
2. Protect existing trees and shrubs not to be removed. Cut back to point of branching all broken branches and skinned areas.
3. Store materials and equipment in cleared areas away from tree roots. Prevent employees and equipment from trampling over woodland, existing planting, and established lawns.

3.2 REMOVALS – TREES ENTIRELY

A. Remove 14 trees where indicated.

B. Top and limb all trees before falling, unless otherwise approved by the Owner's Representative.

C. Chip out stumps to a depth of not less than 12 inches below finished grade. Backfill stump holes with topsoil, and seed.

3.4 PRUNING

A. Prune fourteen (14) trees inside facility of undesirable wood with the resulting crown shaped to the natural habit of the tree, to a minimum of 20 feet clear from buildings. Remove all diseased and dead branches, and branches interfering with building exteriors. All cuts shall be cleanly made with sharp tools, flush with the parent trunk or limb.

3.5 CLEAN UP – TREES TRIMMED AND REMOVED

A. Remove and dispose of all logs, tree trimmings, and debris from State property. Leave Work area in a neat uncluttered condition, where indicated or specified.

3.6 MAINTENANCE AND RESTORATION

A. Restore grades to indicated levels where settlement or damage due to performance of the Work has occurred. Correct conditions contributing to settlement or damage.

B. Restore pavements, walks, curbs, lawns, and other exterior surfaces damaged during performance of the Work to match the appearance and performance of existing corresponding surfaces as closely as practicable.

3.7 WORK AREAS AND PERFORMANCE

A. The Owner's Representative may limit or restrict work areas and scheduling of the tree trimming and/or removal based upon project progress.

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BUILDING STRUCTURE EARTHWORK
SECTION 312000

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Preparing subgrades for slabs-on-grade.
   2. Excavating and backfilling for buildings and structures.
   3. Drainage course for slabs-on-grade.
   4. Subsurface drainage backfill for walls and trenches.
   5. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures within the building envelope.

B. See Appendix C for "Geotechnical Evaluation SUNY New Paltz Bevier Hall," prepared by Tectonic Engineering & Surveying Consultants, P.C. dated August 28, 2014, and revised January 27, 2016 for reference only. This geotechnical report is made available on an informational basis for use in preparing bid proposals for the project. Recommendations contained therein are not part of the contract requirements. All building structure earthwork requirements are contained within specification section 312000.

1.2 UNIT PRICES

A. Unit prices (if any) for earthwork are included in Division 01 Section "Unit Prices."

B. Quantity allowances (if any) for earthwork are included in Division 01 Section "Allowances."

C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
   1. 12 inches outside of concrete forms including at footings.
   2. 6 inches outside of minimum required dimensions of concrete cast against grade.
   3. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   4. 6 inches beneath bottom of concrete slabs-on-grade.
   5. 6 inches beneath pipe in trenches, and 24 inches wider than pipe diameter.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Cushion Material: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

   1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf; measured according to SAE J-1179.

   2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and building structure or slab.

J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

K. Utilities: Underground services within the building's footprint.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Each type of plastic warning tape.
   2. Geotextile.
   3. Controlled low-strength material, including design mixture.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to NYSDOT Soil Material Specifications of each on-site and borrow soil material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 1557 for each on-site and borrow soil material proposed for fill and backfill.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

D. LEED Submittal:
   1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
      a. Include statement indicating costs for each product having recycled content.

   2. Product certificates for Credit MR 5: Documentation indicating location and distance from Project of material manufacturer and point of extraction, harvest or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Preexcavation Conference: Conduct conference at Project site

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.
   3. Notify “Dig Safely, New York” for area where Project is located before beginning earth moving operations.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

C. Do not commence earth moving operations until temporary erosion and sedimentation-control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Selected Fill: Soil material consisting of sound, durable, sand, gravel, stone, and/or blends of these materials, free from organic and other deleterious materials. Comply with the following gradation requirements:

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
4 inch	101.6	100
No. 40	0.425	0-70
No. 200	0.075	0-15

C. Unsatisfactory Soils: Soils not conforming to 2.1 B above.
1. Unsatisfactory soils also include selected fill not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Soil material conforming to NYSDOT Type 2 subbase material.

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
2 inch	50.8	100
1/4 inch	6.35	25-60
No. 40	0.425	5-40
No. 200	0.075	0-10

E. Select Granular Material or Structural Fill: Soil materials conforming to NYSDOT Type 4 subbase material specifications.

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
2 inch	50.8	100
1/4 inch	6.35	30-65
No. 40	0.425	5-40
No. 200	0.075	0-10

F. Cushion Sand: Material consisting of clean, hard, durable, uncoated particles, free from lumps of clay and all deleterious substances and meeting the following gradation requirements of NYSDOT 703-06:

Sieve Size	Percent Passing

Sieve Size	Size opening (mm)	
1/4 inch	6.35	100
No. 60	0.25	0-35
No. 100	0.15	0-10

G. Drainage Course and Course Aggregate: Crushed stone conforming to ASTM C33 Blend No. 57 that complies with the material specification requirements of NYSDOT Article 703-02. Alternatively a 50-50 mix of NYSDOT No. 1 and No. 2 stone is acceptable.

Sieve		Percent Passing
Sieve Size	Size opening (mm)	
1 1/2 inch	37.5	100
1 inch	25.0	95-100
½ inch	12.5	25-60
No. 4	4.75	0-10
No. 8	2.36	0-5

2.2 GEOTEXTILES

A. Filter / Separation Fabric Geotextile: Mirafi 140N, Amoco 4547, or Propex 401.

B. Stabilization Fabric Geotextile: Mirafi 500 X, Amoco 2002, or Propex 200ST.

2.3 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

A. Controlled Low-Strength Material: Conventional weight, self-compacting, flowable concrete material produced from the following:
1. Portland Cement: ASTM C 150, Type I II or III.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260.

B. Produce conventional-weight, controlled low-strength material with compressive strength between 100-psi and 200-psi when tested according to ASTM C 495.

2.4 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.

4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from potential damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 during earthwork operations.

C. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract time may be authorized for rock excavation.
1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
a. 12 inches outside of concrete forms including at footings.

b. 6 inches outside of minimum required dimensions of concrete cast against grade.
c. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
d. 6 inches beneath bottom of concrete slabs on grade.
e. 6 inches beneath pipe in trenches and 24 inches wider than pipe diameter.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR UTILITY TRENCHES WITHIN BUILDING FOOTPRINT

A. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

B. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-compact subgrade below pavements in the following manner. Do not proof-compact wet or saturated subgrades.
   1. Proof compact area bounded by line 5 feet outside limit of contract work. Complete 5 overlapping passes with a smooth drum vibratory roller having a static weight of at least 7 tons. Completely compact the subgrade in one direction, repeating compaction in direction perpendicular to first direction. Limit roller speed to 2 mph.
   2. After proof compaction is completed, proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
   3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Proof-compact subgrade below the building slabs and footings in the following manner. Do not proof-compact wet or saturated subgrades.
   1. Proof compact building slab subgrades with a smooth drum vibratory walk behind roller having a minimum static weight of one ton, completing 3 overlapping passes.
   2. Proof compact footing trench subgrades with a rammer type compactor having a minimum static weight of 125 pounds, completing 3 overlapping passes.

E. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

F. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL WITHIN BUILDING FOOTPRINT

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact cushion material on trench bottoms and where indicated. Shape cushion material to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."

D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Controlled Low-Strength Material: Protect items to be backfilled against flotation. Place initial backfill of controlled low-strength material to a height of 12 inches over the utility pipe or conduit. Coordinate backfilling with utilities testing.

F. Backfill voids with satisfactory soil while installing and removing shoring and bracing.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations under building slabs, footings and foundations as indicated on the contract drawings.

C. Place soil fills on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 8 inches in loose depth for material compacted by hand-operated rammer type tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
   1. Under structures, building slabs, steps, and within utility trenches, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Place drainage course 6 inches or less in compacted thickness in a single layer.
   2. Compact each layer of drainage course to required cross sections and thicknesses with a minimum of two passes of a plate type vibratory compactor.

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Allow special inspector with testing agency to inspect and test subgrades and each fill or backfill layer at 25 feet intervals along the building perimeter. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements. Subsequent verification and approval of other backfill areas may be based on a visual comparison of subgrade with tested subgrade when approved by Owner's Representative.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
1. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 25 feet or less of wall length, but no fewer than two tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 25 feet or less of wall length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
B. Repair and reestablish grades to the specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; re-shape and re-compact.
C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

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SECTION 312513
EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

B. Topsoil: Section 329120.

C. Seeding: Section 329219.

D. Corrugated Polyethylene Storm Drain Pipe: Section 334104.

1.2 REFERENCES

A. Erosion and Sediment Control Guidelines: Conform to the latest edition of "NEW YORK STANDARDS and SPECIFICATIONS for EROSION and SEDIMENT CONTROL" by NYS Department of Environmental Conservation DOW (i.e., Bluebook). Refer to these guidelines for construction and maintenance of all items.

1.3 RESPONSIBILITY

A. During construction conduct operations in such a manner as to prevent or reduce to a minimum any damage to any water body from pollution by debris, sediment, chemical or other foreign material, or from the manipulation of equipment and/or materials in or near a stream or ditch flowing directly to a stream. Any water which has been used for wash purposes or other similar operations which become polluted with sewage, silt, cement, concentrated chlorine, oil, fuels, lubricants, bitumens, or other impurities shall not be discharged into any water body.

B. In the event of conflict between these specifications and the regulation of other Federal, State, or local jurisdictions, the more restrictive regulations shall apply.

1.4 DESCRIPTION

A. The Work shall consist of furnishing, installing, inspecting, maintaining, and removing soil and erosion control measures as shown on the contract documents or as ordered by the Owner's Representative during the life of the contract to provide erosion and sediment control.

B. Temporary structural measures provide erosion control protection to a critical area for an interim period. A critical area is any disturbed, denuded slope subject to erosion. These are used during construction to prevent offsite sedimentation. Temporary structural measures shall include construction road stabilization, stabilized construction entrance, dust control, silt fence, storm drain inlet protection or other erosion control devices or methods as required.

C. Permanent structural measures also control protection to a critical area. They are used to convey runoff to a safe outlet. They remain in place and continue to function after completion of construction. Permanent structural measures shall include land grading, or other erosion control devices or methods as required.

D. Vegetative measures shall include mulching, protecting vegetation, seeding and topsoil.

1.5 DEFINITIONS – TEMPORARY STRUCTURAL MEASURES

A. Construction Road Stabilization: Stabilization of construction roads to control erosion.

B. Stabilized Construction Entrance: A stabilized pad of aggregate underlain with geo-textile where traffic enters a construction site to reduce or eliminate tracking of sediment to public roads.

C. Dust Control: Prevent surface and air movement of dust from disturbed soil surfaces.

D. Silt Fence: A barrier of geo-textile fabric installed on contours across the slope to intercept runoff by reducing velocity. Replace after 1 year.

E. Storm Drain Inlet Protection: A semi-permeable barrier installed around storm inlets to prevent sediment from entering a storm drainage system.

1.6 DEFINITIONS – PERMANENT STRUCTURAL MEASURES

A. Retaining Wall: A structural wall constructed to prevent soil movement down steep slopes.

1.7 DEFINITIONS – VEGETATIVE MATERIALS MEASURES

A. Mulches: Hay, straw, wood cellulose, fiber mats, flexible growth medium and other materials approved by the Owner's Representative.

B. Protecting Vegetation: Protecting trees, shrubs, ground cover and other vegetation from damage.

C. Temporary Seeding: Erosion control protection to a critical area for an interim period. A critical area is any disturbed, denuded slope subject to erosion.

D. Permanent Seeding: Grasses established and combined with shrubs to provide perennial vegetative cover on disturbed, denuded, slopes subject to erosion.

E. Topsoil: Placed before permanent seeding or sod is installed.

PART 2 PRODUCTS

2.1 MATERIALS

A. Seeding: Permanent see Section 329219.

2.2 TEMPORARY STRUCTURAL

A. Silt Fencing:
   1. 100X Prefabricated Silt Fence, Mirafi, 365 South Holland Drive, Pendergrass, GA 30567, (888) 795-0808, www.mirafi,com
   2. IVI 3611W Wire Back Silt Fence, Indian valley Industries, Inc., P.O. Box 810, Johnson City, NY 13790, (800) 659-5111, www.ivindustries.com
   3. Or approved equal

B. Orange Warning Fence:
   High Visibility Orange Safety Fence (HDPE) installed on wood or steel posts. Height is 4-feet.

PART 3 EXECUTION

3.1 WORK AREAS

A. The Owner's Representative has the authority to limit the surface area of erodible earth exposed by earthwork operations and to direct the Contractor to provide immediate temporary or permanent erosion measures to minimize damage to property and contamination of watercourses and water impoundments. Under no circumstances will the area of erodible earth material exposed at one time exceed 50,000 sq. ft. The Owner's Representative may increase or decrease this area of erodible earth material exposed at one time as determined by his analysis of project, weather and other conditions. The Owner's Representative may limit the area of clearing and grubbing and earthwork operations in progress commensurate with the Contractor's demonstrated capability in protecting erodible earth surfaces with temporary, permanent, vegetative or biotechnical erosion control measures.

B. Schedule the work so as to minimize the time that earth areas will be exposed to erosive conditions. Provide temporary structural measures immediately to prevent any soil erosion.

C. Provide temporary seeding on disturbed earth or soil stockpiles exposed for more than 7 days or for any temporary shutdown of construction. In spring, summer or early fall apply rye grass at a rate of 1 lb/ 1000 sq.ft. In late fall or early spring, apply certified Aroostook Rye at a rate of 2.5 lbs./ 1000 sq. ft. Apply hay or straw at a rate of 2 bales/ 1000 sq. ft. or wood fiber hydromulch at the manufacturer's recommended rate. Hay or straw shall be anchored.

D. Coordinate the use of permanent controls or finish materials shown with the temporary erosion measures.

E. All erosion and sediment control devices must be maintained in working order until the site is stabilized. All preventative and remedial maintenance work, including clean out, repair, replacement, re-grading, re-seeding, or re-mulching, must be performed immediately.

F. After final stabilization has been achieved temporary sediment and erosion controls must be removed. Areas disturbed during removal must be stabilized immediately.

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SECTION 321216
ASPHALT CONCRETE PAVING

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

B. Pavement Marking: Section 321723.

1.2 SUBMITTALS

A. Product Data: Manufacturer's name, specifications, and installation instructions, for each item specified.

B. Quality Control Submittals:
1. Plant name and location of asphalt concrete supplier.

1.3 PROJECT CONDITIONS

A. Environmental Requirements:
1. Discontinue paving when surface temperatures fall below requirements listed in DOT Table 402-1.
2. Do not place asphalt concrete on wet surfaces, or when weather conditions otherwise prevent the proper handling or finishing of bituminous mixtures as determined by the Owner's Representative.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Concrete Paving: Conform to DOT Section 400 Hot Mix Asphalt, 80 Series.
1. Top Course: HMA 12.5 mm, F3
2. Binder Course: HMA 19.0 mm, F9

B. Asphalt Cement Tack Coat.

PART 3 EXECUTION

3.1 ASPHALT CONCRETE PAVING

A. Construct asphalt pavement in accordance with DOT, Section 402-3 except as follows:
1. Paragraph 402-3.06: Change 1250 sq. meters to read 420 sq. meters.

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SECTION 321223
TEXTURED ASPHALT

PART 1 GENERAL

1.1 SUBMITTAL

A. Product Data: Manufacturer's name, catalog cut-sheets, specifications, and installation instructions.

B. Quality Control Submittals: Equipment information for application equipment below.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: A list of jobs completed within the last two years that required imprinted asphalt installation.

B. Manufacturer Qualifications: Proof of manufacturer certification.

PART 2 PRODUCTS

2.1 IMPRINTING

A. Layout and imprinting pattern into the surface of the HMA shall be "offset brick" pattern as per the manufacturer (dimensions 4 ¾" by 9 5/8"). Pattern direction to be as shown on the drawings or as directed by the Owner. Basis of design is Streetprint Pavement Texturing System.

2.2 COATING(S)

A. Top Coat: Must be composed of a premium epoxy modified, acrylic, waterborne coating specifically designed for application on asphalt pavements. It has a balance of properties to ensure good adhesion and movement of flexible pavement, while providing good durability. The coating must be durable in both dry and wet environments. Top coat to be StreetBond 150 or approved equal.

B. Base Coat: Must be composed of a high-performance cementitous, epoxy modified, acrylic based, waterborne surfacing product designed for application on textured asphalt pavements. This product is used as a base coat only. Base coat to be StreetBond CemBase or approved equal.

C. Colorant: Red; to match existing color used at LeFevre and Bevier Halls. Colorant to be a highly concentrated, high quality, UV stable pigment blend. Colorant ratio as determined by manufacturer.

2.2 PROPERTIES

A. Skid Resistance: The surface of the material shall contain factory applied anti-skid/anti-slip elements. Upon application the material shall provide a minimum skid resistance value of 60 BPN when tested according to ASTM E 303.

B. Thickness: The material must be supplied at a minimum thickness of 25 mil.

C. Environmental Resistance: The material must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline.

PART 3 EXECUTION

3.1 APPLICATION

A. Manufacturer Certified Applicator Requirement: The System shall be supplied and applied only by an applicator certified by the System manufacturer. The applicator shall provide proof of current certification before commencing work. The Certified Applicator shall follow the System manufacturer's current published application procedures.

B. Substrate Condition: The System must only be applied to a stable, high quality asphalt pavement substrate over a stable base that is free of defects, as per the manufacturer's published Substrate Guide. The asphalt pavement surface shall be dry and free from all foreign matter, including but not limited to dirt, dust, de-icing materials, and chemical residue.

C. Procedure: Imprinting can proceed immediately after the hot asphalt has been placed and compacted, while the asphalt is still in a warm to hot pliable state. Alternatively, imprinting can be carried out at a later stage, on existing asphalt, by applying heat to the asphalt surface to make the upper portion of the asphalt surface pliable enough to accept the imprint of the template. The application of heat to existing asphalt surface shall be done using re-heating equipment, such as infrared heaters or hot air heaters. Overheating of the asphalt shall not be permitted. Direct flame heaters shall not be allowed to be used for the purpose of heating the asphalt. It is recommended that the temperature of the asphalt surface be regularly monitored during the reheating process to avoid overheating and degradation of the asphalt.

D. The Contractor shall apply the surface system only when the air temperature is at least 50° F and rising, and will not drop below 50° F within 8 hours of application of the coating. There should be no precipitation expected within 2 hours after applying the top coat.

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SECTION 321243
POROUS FLEXIBLE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Base course, over sub-base prepared by others.

B. Porous Pavers.

C. Parking Delineators.

D. Grass fill.

1.2 RELATED SECTIONS

A. Section 310000 - Earthwork.

1.3 REFERENCES

A. AASHTO - Guide Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Shop Drawings: Submit manufacturer's shop drawings including laying pattern and parking delineators locations.

C. Samples: Submit two square samples of Permeable Pavers Units product specified.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic fertilizing and maintenance.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum for five years documented experience with the products specified.

B. Installer Qualifications: Installer experienced in performing work of this section that has specialized in installation of work similar to that required for this project. Installer must also be able to provide skilled workman with satisfactory record of performance on landscaping or paving projects of comparable size and quality.

C. Pre-Installation Meetings:
   1. Convene a pre-installation meeting a minimum of two weeks prior to start of porous paving systems.
   2. Verify project requirements, subbase and base conditions, manufacturer's installation instructions and coordination with other related work.
   3. Require attendance of parties directly affecting work of this section, including the Contractor, Architect, engineer, and installer. Manufacturer's representative may attend by phone conference as needed.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect porous paver units from damage during delivery and store under tarp when time from delivery to installation exceeds 30 days.

C. Protect materials during handling and installation to prevent damage.

1.7 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions recommended by manufacturer for desired results. Do not install products under conditions outside manufacturer's absolute limits.

B. Do not begin installation of porous pavements until all hard surface paving adjacent to porous pavement areas, including concrete walks and asphalt paving, is completed.

C. Install turf when ambient air temperature is at least 55 degrees F.

D. In wet weather, do not build on wet, saturated or muddy subgrade

E. In cold weather, do not use frozen materials or materials coated with ice or frost, and do not build on frozen base or wet, saturated or muddy subgrade.

F. Protect partially completed porous paving against damage from other construction traffic when work is in progress.

G. Protect Grass Fill / Sodded paving areas from traffic until grass root system has matured for at least 3 to 4 weeks. Use barricades to only permit accessible by emergency and fire equipment

1.9 WARRANTY

A. Provide with the manufacture's 5 year limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: TRUEGRID PRO PLUS Pavers; 2500 Summer St., Suite 3225, Houston, TX 77007. Phone: 1-855-355-GRID. Email: nwood@truegridpaver.com Website: www.truegridpaver.com

B. Or approved equal.

2.2 PRODUCTS

A. Permeable Pavers:
1. AASHTO H20, HS20 Rated.
2. Manufactured in the USA.
3. High density polyethylene (HDPE): 100 percent post consumer recycled materials
4. Recycled and recyclable content: 100 percent
5. Color: black- carbon black additive for long term UV stabilization
6. Paver size: 24 inches by 24 inches by 1.8 inches.
7. Pre-assembled: 4 foot by 4 foot sections
8. Cylindrical cell design for column strength

9. Cell size: 3.30 inch inside diameter
10. Co-joined cells at 48 places for strength
11. Wall thickness: 0.150 inch /.250-inch nominal
12. A minimum of 2 co-joined common walls per cell for structural integrity
13. Connections:
    a. No clips or stakes necessary
    b. No additional parts or tools needed
    c. Integral male-female three point locking system
    d. Wall thickness at tabs: 0.290 inch
14. Molded in X-anchors to stabilize pavers: no stakes necessary
15. S-Flexural joints molded in for soil seasonal expansion and contraction
16. Nominal Coverage per Paver: 4 square feet
17. Weight per paver: 5.25 lbs.
18. Permeability of System: 100 percent
19. Compressive Strength (filled): 1,152,000 psf; 8000 psi
20. Material Safety: ground water neutral, 100 percent inert
21. Chemical Resistant: Excellent: highly resistant to hydrocarbons, oils

B. Parking Delineators: Basis of Design: TRUEGRID SuperSpot for grass or gravel applications.
1. H20, HS20 rated
2. Domed and ribbed for super strength.
3. Long term UV stabilized
4. 0.90-inch profile above grid
5. 3.25-inch diameter

C. Base Course: Locally sourced angular stone/clean for base material. Crushed granite, sandy gravel material, crushed concrete, limestone rock, and crushed lava are some of the acceptable materials. Variations in permeability of aggregate should be:
1. Conforming to the following sieve analysis and requirements:
    a. Percent Passing: 100 - Sieve Size: 3⁄4 – 1 inch
    b. Percent Passing: 85 - Sieve Size: 3/8 inch
    c. Percent Passing: 60 - Sieve Size: #4
    d. Percent Passing: 30 - Sieve Size: #40
    e. Percent Passing: <3 - Sieve Size: #200
2. Sources of the material may include "pit run" or "crusher run". Crusher run material will typically require sand to be added (20 to 30 percent by volume) for long term high porosity. Should local sources not be available an alternative mixture can be created by mixing 2/3 crushed stone (0.75 inch diameter) with 1/3 sand as available.
3. Geo grid or Geo fabric may be required for soil stabilization between sub grade and base material. Consult with site engineer for specifics or recommendation.

D. Grass Fill: A sandy loam or loam soil should be used to fill the empty grass paver cells. The selection of sandy loam or loam soil should be made based upon the soil requirements of the turf variety selected for the project. Other soils if compatible with type of seed or sod are acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before beginning installation, verify site conditions are as indicated on the drawings. Notify the Architect if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.

B. Ensure that adjacent hard-surfaced paving work is completed before installing porous pavement system.

3.2 PREPARATION

A. Subgrade:
1. Prepare subgrade as specified in Section 310000. Verify subgrade in accordance with porous paving system manufacturer's instructions.
2. Excavate area allowing for unit thickness and the engineered base depth (where required).
3. Provide adequate drainage from excavated area if area has potential to collect water, when working with in-place soils that have poor permeability.
4. Ensure in-place soil is relatively dry and free from standing water.
5. Uniformly grade base.
6. Level and clear base of large objects, such as rocks and pieces of wood.

B. Base Preparation:
1. Verify engineered base is installed in accordance with porous paving system manufacturer's instructions.
2. If required, place a geotextile separation layer between the natural ground and the engineered base.
3. Place base course material over prepared sub base to grades indicated on the Drawings or from manufacturer’s recommended depths per application type.
4. Place in lifts not to exceed 4 inches, compacting each lift separately to 95 percent Modified Proctor for non-open grade material. Open grade base material to be leveled and heavily compacted in 4 inch lifts to settle and lock in angular stone.
5. Leave minimum 1.8 inch for Permeable Paver unit for final elevation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install Permeable Paver units by placing cells face up. Sheets are preassembled in 4 foot by 4 foot sheets are connected with friction fit interlocking connectors. No tooling are required to connect or disconnect units. Sheets may be separated into 4 Individual 24 inch by 24 inch pieces and reconfigured as needed. Cut units around curves and organic shapes with an electrical handsaw. Place units to maintain a 1 inch clearance to

any pre- installed object or surface structure. Top of cells shall be between 0.25 inch to 0.5 inch below the surface of adjacent hard-surface pavements.

C. Hydro seeding/Hydro-Mulch Surfacing: Provide and place as specified in Section 329219. Homogeneously mix a combination of water, seed and fertilizer in a truck mounted tank. Spray the seed mixture onto the site at specification rates. Coverage should be uniform and complete. Following germination of the seed, areas lacking germination larger than 8 inches by 8 inches must be reseeded immediately. Seeded areas must be fertilized and kept moist during development of the turf.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Grass Fill / Seeded: Protect seeded areas from any traffic, other than emergency vehicles, for a period of 4 to 6 weeks, or until the grass is mature to handle traffic. Avoid sharp turns or "jack knifes" in trailered vehicles when cells are empty. Damage due to buckling can occur.

C. Repair or replace damaged products before Substantial Completion.

3.5 MAINTENANCE

A. Maintain grass in accordance with manufacturer's instructions and as specified in Section 329219.

B. Monitor pavement to ensure traffic frequency and loading does not exceed the pavement design.

C. When snow removal is required, keep a metal edged plow blade from coming in contact with the surface during plowing operations to avoid causing damage to the units. Use a plow blade a minimum of 1 inch above the surface and with a flexible rubber edge or with skids on the lower outside corners so the plow blade does not come in contact with the units.

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SECTION 321300
CONCRETE WALKS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

B. Concrete Paving Joint Sealants: Section 321373.

1.2 REFERENCES

A. Comply with American Concrete Institute, ACI 301-05, for the Work of this Section unless otherwise indicated on the drawings or specified.

1.3 SUBMITTALS

A. Product Data:
1. Concrete Design Mix: Submit proposed concrete design mix together with name and location of batching plant at least 28 days prior to the start of concrete work.
2. Portland Cement: Brand and Manufacturer's name.
3. Air-entraining Admixture: Brand and manufacturer's name.
4. Water-reducing or High Range Water-reducing Admixture: Brand and manufacturer's name.
5. Curing and Anti-Spalling Compound: Manufacturer's specifications and application instructions.
6. ADA Detectable Warning Surface: Manufacturer's specifications, product data, test reports, method of installation, and maintenance instructions.

B. Samples:
1. ADA Detectable Warning Surface: Two samples, the same color as the material to be installed, 6 inches x 8 inches minimum.

C. Material Certificates:
1. Steel reinforcement and accessories.

1.4 QUALITY ASSURANCE

A. Concrete batching plants shall be currently approved as concrete suppliers by the New York State Department of Transportation.

B. Performance Criteria: The following criteria are required for the products included in this section:
1. Cast-in-place Concrete shall contain post-industrial and/or post-consumer recycled content as follows:
a. Fly Ash: ASTM C618, including Table 1, except for footnote A, Class F, except loss on ignition shall not exceed 4.0 percent. Concrete shall incorporate fly ash as a replacement for 15 percent (by weight) of the Portland cement. All design mixes are subject to review and

approval by the Owner.

b. GGBF (Ground Granulated Blast Furnace) Slag: Concrete shall incorporate GGBF slag as a replacement for at least 20 percent (by weight) of the Portland cement. All design mixes are subject to review and approval by the Owner.

c. Certification of recycled content shall be in accordance with the SUBMITTALS Article above.

d. Recycled Steel: Reinforcing bar, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 35 percent (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials).

1.5 DELIVERY

A. ASTM C 94/C 94M, Article 14 - Batch Ticket Information: In addition to the information required by Paragraph 14.1, also include the following:
   1. Type and brand, and amount of cement.
   2. Weights of fine and coarse aggregates.
   3. Class and brand, and amount of fly ash (if any).

PART 2 PRODUCTS

2.1 MATERIALS

A. Cast-In-Place Concrete: Normal weight, air entrained concrete with a minimum compressive strength of 4,000 psi with a minimum of 611 pounds of cement per cubic yard, at the end of 28 days.
   1. Design Air Content: ASTM C 260, and on the New York State Department of Transportation's current "Approved List"; 6 percent by volume plus or minus 1.5 percent.
   2. Cement: ASTM C 150 Type I or II Portland cement. Minimum 6.5 bags or 611 pounds per cubic yard.
   3. Water: Potable.
   4. Slump: Maximum 4 inches; minimum 2 inches before the addition of any water-reducing admixtures or high-range water-reducing admixtures (superplasticizers) at the site. Except when a water-reducing admixture is used, maximum slump shall be 6 inches and when a high range water reducing admixture is used maximum slump shall be 8 inches.
   5. Water-reducing Admixture: ASTM C 494 / C 494M-04 Type A and on the New York State Department of Transportation's current "Approved List".
   6. High Range Water-reducing Admixture: ASTM C 494 / C 494M-04 Type F and on the New York State Department of Transportation's current "Approved List".
   7. Retarding Admixture: ASTM C 494, Type D, Water-reducing and retarding, for use in hot weather concreting, and on the New York State Department of Transportation's current "Approved List".

B. Chemical Curing and Anti-Spalling Compound: ASTM C-309, Type 1D, Class B, with minimum 18 percent total solids content. No thinning of material allowed. The volatile organic compound (VOC) content of concrete curing compounds shall meet requirements of the EPA national AIM VOC regulations.
   1. SureCure Emulsion, Kaufman Products, Inc. 3811 Curtis Avenue, Baltimore, MD 21226, (800) 637-6372.
   2. Cure & Seal by Symons Corp., 200 East Touhy Ave., PO Box 5018, Des Plaines, IL 60017-5018, (847) 298-3200.
   3. Kure-N-Seal by Sonneborn/ BASF Building Systems, 889 Valley Park Dr., Shakopee, MN 55379, (800) 433-9517.
   4. Day-Chem Cure & Seal UV 26 percent (J-22 UV) by Dayton Superior Corp., 721 Richard St., Miamisburg, OH 45342, (800) 745-3700.
   5. Acrylseal HS by Master Builders/ BASF Building Systems, 23700 Chagrin Blvd., Cleveland, OH 44122, (800) 628-9990.

C. Wire Mesh: 6x6 – W2.9 x W2.9

D. ADA Detectable Warning Surface: Precast or prefabricated paving units or detectable Warning plate with a non-slip texture on the travel surface. Color shall be a shade of **brick red**. There shall be a minimum of 70 percent contrast in light reflectance between the detectable warning surface and the adjoining surfaces. Material used to provide visual warning shall be an integral part of the detectable warning surface. Visual contrast to meet the existing ADAAG A4.2.9.2.
   1. Detectable Warning Plate Model 22144 by Engineered Plastics Inc. (Armor-Tile), 300 International Drive Suite 100, Williamsville, NY 14221, (800) 682-2525, www.armor-tile.com
   2. Or approved equal.

PART 3 EXECUTION

3.1 PREPARATION

A. Do not use items of aluminum for mixing, chuting, conveying, forming, or finishing concrete. However, magnesium alloy tools may be used for finishing.

B. Set forms true to line and grade and anchor rigidly in position.

C. Space expansion joints equally at not more than 20'-0" on center unless otherwise indicated. Place expansion joints to isolate sidewalk from other structures and fixed objects.

D. Place joint filler at expansion joints and where new concrete abuts existing concrete paving and fixed structures or appurtenances. Protect the top edge of the joint filler during concrete placement with a temporary cap and remove after concrete has been placed.

3.2 PLACING WIRE MESH:

A. At the time concrete is placed, reinforcement shall be free of mud, oil, loose rust, loose mill scale, and other materials or coatings that may adversely affect or reduce the bond.

B. Unless otherwise shown differently on the Drawings, all reinforcement to be placed per ACI 301-05.

3.3 PLACING CONCRETE

A. Consolidate concrete by spading, rodding, forking, or using an approved vibrator eliminating all air pockets, stone pockets, and honeycombing. Work and float concrete surface so as to produce a uniform texture.

B. Locate construction joints, if any, at expansion joints.

3.4 PLACING ADA DETECTABLE WARNING SURFACE

A. The ADA detectable warning surface shall be installed behind the edge of the curb.

B. Domes shall be aligned on a square grid in the predominant direction of travel to permit wheels to roll between the domes.

C. Install in accordance with the manufacturer's printed instructions.

D. The curb, ADA detectable warning surface, and sidewalk shall be flush with the elevation of the road surface.

3.5 FINISHING AND CURING

A. Wait until bleeding is stopped before final finishing operations.

B. Keep surface damp but not wet between initial strike off and final finish.
   1. Utilize a fog spray, evaporative inhibitor, or midrange water reducer that is compatible with supplementary cementing materials to help control the amount of surface drying of the fresh concrete.

C. Use minimal working of the surface during finishing.

D. Utilize a magnesium or wood float.

E. Avoid the use of steel finishing trowels and utilize a concrete finishing machine when possible.

F. Finish edges of walk and expansion and control joints with a 1/4 inch radius edging tool.

G. Provide broom finish for walk surfaces.

H. Apply curing and anti-spalling compound in accordance with the manufacturer's printed instructions.

I. Apply curing immediately after final finish.

J. Hot Weather Concreting: Comply with ACI 305R whenever the atmospheric temperature or the form surface temperature is at or above 90 degrees F., or climatic conditions of wind and/or low humidity will cause premature drying of the concrete.

K. Curing Temperature: Maintain the temperature of the concrete at 50 degrees F. or above during the curing period. Keep the concrete temperature as uniform as possible and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceeds 5 degrees F. in any one hour and 50 degrees F. in any 24-hour period.

L. Provide tooled control joints ¾" inch deep. Space control joints equally between expansion joints approximately 5'-0" on center, except where a different spacing is shown on the drawings.

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SECTION 321373
CONCRETE PAVING JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Walks: Section 321300.

B. Granite Curbs: Section 321640.

1.2 SUBMITTALS

A. Product Data: Catalog sheets, specifications, and installation instructions for each product specified except miscellaneous materials.

1.3 QUALITY ASSURANCE

A. Container Labels: Include manufacturer's name, trade name of product, kind of material, federal specification number (if applicable), expiration date (if applicable) and packaging date or batch number.

1.4 PROJECT CONDITIONS

A. Environmental Conditions:
1. Temperature: Unless otherwise approved or recommended in writing by the sealant manufacturer, do not install sealants at temperatures below 40 degrees F or above 85 degrees F.
2. Humidity and Moisture: Do not install the Work under this Section under conditions that are detrimental to the application, curing and performance of the specified materials.

B. Protection:
1. Protect all surfaces adjacent to sealants with non-staining removable tape or other approved covering to prevent soiling or staining.

PART 2 PRODUCTS

2.1 SEALANTS

A. Sealant:
1. For Horizontal Joints: Two-part, non-sag, polyurethane elastomeric sealant for traffic bearing construction. Meets ASTM C-920, Type M.
Sika Sikaflex-2cNS or approved equal.

2.2 JOINT FILLERS

A. Cork Joint Filler: Resilient, non-extruding type premoulded cork units; ASTM D 1752 Type II.

B. Closed Cell Polyurethane Joint Filler: Resilient, compressible, semi-rigid; W.R. Meadows' Ceramar or A.C. Horn's Closed Cell Plastic Foam Filler, Code 5401.

2.3 MISCELLANEOUS MATERIALS

A. Cleaning Solvents: Oil free solvents as recommended by the sealant manufacturer. Do not use re-claimed solvents.

B. Masking Tape: Removable paper or fiber tape, self-adhesive, non-staining.

2.4 COLOR OF MATERIALS

A. For exposed materials furnish color as selected by the Owner from the manufacturer's standard colors. For concealed materials, provide the natural color which has the best overall performance characteristics.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean joint surfaces immediately before installation of sealant and other materials specified in this Section.
   1. Remove all loose materials, dirt, dust, rust, oils and other foreign matter that will impair the performance of materials installed under this Section. When necessary or when directed, wire brush, grind, or acid etch to thoroughly clean joint surfaces.

3.2 JOINT FILLER INSTALLATION

A. Set joint fillers at proper depth and position as required for installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of joint filler units.
   1. Smooth Edged Joints: For joints between two concrete slabs or where new concrete abuts smooth edged materials use either filler as specified.
   2. Irregular Edged Joints: For joints where new concrete abuts granite curbs or other irregular edges use closed cell polyurethane joint filler.

3.3 SEALANT INSTALLATION

A. Except as shown or specified otherwise, install sealants in accordance with the manufacturer's printed instructions.

B. Apply sealant with ratchet hand gun or other approved mechanical gun. Where gun application is impractical, apply sealant by knife or by pouring as applicable.

C. Finishing: Provide a neat smoothly finished joint with a slightly concave surface unless otherwise indicated or recommended by the manufacturer.
   1. Use tool wetting agents as recommended by the sealant manufacturer.

3.5 CLEANING

A. Immediately remove misapplied sealant and drippings from metal surfaces with solvents and wiping cloths. On other materials, remove misapplied sealant and droppings by methods and materials recommended in writing by the manufacturer of the sealant material.

B. After sealants are applied and before skin begins to form on sealant, remove all masking and other protection and clean up any remaining defacement caused by the Work.

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SECTION 321640
GRANITE CURBS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical data.

B. Shop Drawings: Submit setting drawings showing typical and special sizes, dimensions, sections, profiles of curb units, jointing and setting details.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stone: Granite shall be tough, dense, sound and durable, of uniform light color, reasonably fine grained and free from seams, cracks or other structural defects.

B. Granite Curbs:
1. Match existing curb as to color, appearance and dimensions. Color to be "Blue Sky" Elberton Gray.
2. Furnish curbs 5" x 16" with split face, Type A, with sawed top and ends. Straight pieces shall be a minimum of 3 feet long. Curb segments on curves with radius of 100 feet or less shall be shaped to the required curvature, with the ends split on radial lines.
3. Indicated dimensions for curb segments shall not vary more than 2 inches for depth and 1 inch for width.
4. Top and front surfaces shall be true planes at right angles to each other, as seen with a straight edge. No projection greater than 3/4 inch or depression greater than 1/2 inch on the split surfaces will be acceptable. Top surface shall not vary more than 1/8 inch.
5. Drill holes will not be permitted in exposed curb surfaces.

C. Dry Concrete: One part Portland cement mixed with six parts DOT No. 1A coarse aggregate dry mix.

PART 3 EXECUTION

3.1 INSTALLATION

A. Set curbs true to line and grade on a foundation of one cubic foot of dry concrete for each linear foot of curb installed. Fill voids to completely support entire length of curb.

B. Butt joint curb sections together.

*****

SECTION 321723
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SUBMITTALS

A. Samples:
   1. Paint: One pint, each type. Include the manufacturer's label with product analysis.

B. Quality Control Submittals:
   1. Certificates: Affidavit required under Quality Assurance Article.

1.02 QUALITY ASSURANCE

A. Certification: Affidavit by the paint applicator, certifying that the materials comply with the current regulatory requirements in effect at the time products were delivered and applied.

1.03 PROJECT CONDITIONS

A. Perform the painting operations after working hours, on weekends or at such time so as not to interfere with the flow of traffic. Provide temporary barriers to prevent vehicles from driving over newly painted areas.

B. Apply paint on dry pavement surface, when the air temperature is above 40 degrees F.

PART 2 PRODUCTS

2.01 MATERIALS

A. Paint: DOT Section 640-2, white or as indicated, or if not indicated as directed. Delete reference to Glass Beads.

B. Rapid Dry Paint:
   1. Aexcel Corp., www.aexcelcorp.com, 12W-D273 White
   2. Sherwin-Williams, www.swpavementmarkings.com, TM-9702 White
   3. Ennis Flint: 985201 White, 985205 Blue
   4. Or approved equal

PART 3 EXECUTION

3.01 PREPARATION

A. Remove dust, dirt, and other foreign material detrimental to paint adhesion.

B. Mark layout of stripes and lines with chalk or paint.

3.02 APPLYING PAVEMENT MARKING

A. Apply paint in accordance with DOT Section 640-3.02, except as follows:
   1. Delete references to Glass Beads.

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SECTION 321823
BASKETBALL COURT SURFACING ON NEW HOT MIX ASPHALT

PART 1 GENERAL

1.1 SUBMITTALS

A. Product Data: Manufacturer's catalog sheets, specifications, and installation instructions.

B. Maintenance Data for each product

PART 2 PRODUCTS

2.1 COURT SURFACING MATERIAL

A. Manufacturer:
1. SportMaster and Level Master with Sand by ThorWorks Industries, Inc. ,2520 S. Campbell Street, Sandusky, OH 44870, (800) 326-1994, www.thorworks.com
2. Or approved equal.

B. All coatings shall be pure acrylic, containing no asphaltic or tar emulsions, nor any vinyl, alkyd or non-acrylic resins. The color system shall be factory-mixed compounds requiring only the addition of water at the jobsite except for the addition of sand to the surface. All materials shall be delivered to the jobsite in sealed containers with the manufacturer's label affixed.

2.2 LINE MARKINGS

A. Paint Primer:
1. Seal-A-Line by NOVA Sports U.S.A, 8 Commercial Way, Milford, MA 01757, (800)872-6682.
2. Or approve Equal.

B. Line Paint, Textured:
1. Novatex textured line paint by NOVA Sports U.S.A, 8 Commercial Way, Milford, MA 01757, (800)872-6682.
2. Or approved equal

PART 3 EXECUTION

3.1 APPLICATION

A. New asphalt pavement shall cure for 14 days prior to application of any surfacing materials.

B. Contractors must notify the Owner's Representative of all applications, 48 hours prior to installation.

C. The surface to be coated shall be inspected and made sure to be free of grease, dirt, oil, dust and other foreign material before starting work.

D. The surface shall be flooded. Any ponding water remaining that is deep enough to cover the thickness of a nickel shall be corrected using a patch mix as per the manufacturer's instructions.

E. Application shall proceed only if the surface is dry and clean and the temperature is at least fifty degrees (50° F) and rising, and the surface temperature is not in excess of one hundred and forty (140°F). Do not apply coatings when rain is imminent.

F. Each coat in this system must dry completely before next application. Between each coat, inspect entire surface. Any defects should be repaired. Scarpe surface to remove any lumps, and broom or blow off all loose matter.

G. Stir material thoroughly before using. Keep from freezing. Close container when not in use. Apply LevelMaster with Sand with a soft rubber squeegee. Apply successive coats in cross directions. Scrape all rough spots and ridges before applying the next coat.

H. Let dry for 30-60 minutes under optimum drying conditions. Allow at least 6 hours of cure time before applying a second coat.

3.2 SURFACE COLORING

A. Upon completion of surface, the contractor shall prepare for the Color Concentrate with Sand.

B. Pavement surface must be cleaned entirely of dust, dirt, debris and all loose materials. Repair of pavement surface defects, depressions and cracks must be completed prior to application. All repairs must be flush and smooth to adjoining surfaces.

C. Apply mixed concentrate with Sand with soft rubber squeegees. Allow each coat to thoroughly dry before applying the next coat.

D. Let dry for 30-60 minutes under optimum drying conditions. Allow at least 6 hours of cure time before applying a second coat.

3.3 LINE MARKINGS

A. Upon completion and acceptance of the basketball surface, the Contractor shall prepare and paint lines for Basketball.

B. All lines are to be applied by painting between masking tape with a paintbrush or roller, according to the contract drawings.

C. Prime maksed lines with Seal-A-Line or approved equal. Allow application to dry.

D. Paint lines with Novatex textured line paint or approved equal. Allow application to dry.

E. Remove masking tape immediately after lines are dry.

F. Protect adjacent areas and structures (fences, posts, sidewalks, buildings, etc.) which are not to be coated. In the event that coatings are applied to above, remove immediately before drying is complete.

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SECTION 323113
CHAIN LINK FENCE

PART 1 GENERAL

1.1 REFERENCES

A. Comply with ASTM A 53 for requirements of Schedule 40 piping.

1.2 SUBMITTALS

A. Shop Drawings: Complete detailed drawings for each height and style of fence and gate required. Include separate schedule for each listing all materials required and technical data such as size, weight, and finish, to ensure conformance to specifications.

B. Product Data: Manufacturer's catalog cuts, specifications, and installation instructions for each item specified.

C. Samples:
1. Fence Fabric: Minimum one square foot.
2. Fence and Gate Posts: Two each, one foot long, if requested.
3. Miscellaneous Materials and Accessories: One each, if requested.

1.3 QUALITY ASSURANCE

A. Comply with standards of the Chain Link Fence Manufacturer's Institute.

B. Provide steel fence and related gates as a complete compatible system including necessary erection accessories, fittings, and fastenings.

C. Posts and rails shall be continuous without splices.

E. Concrete batching plants shall be currently approved as concrete suppliers by the New York State Department of Transportation.

PART 2 PRODUCTS

2.1 MATERIALS

A. Class B Steel Tubing (Option):
1. SS-40 Fence Pipe by Allied Tube & Conduit Corp., 16100 S. Lathrop Ave., Harvey, IL, 60426, (800) 882-5543.
2. Tuf-40 Fence Framework by American Tube and Pipe Co., Inc., 2525 N. 27th Ave., Phoenix, AZ 85009, (800) 669-8823.

2.2 STEEL FRAMEWORK

A. End Posts, Corner Posts and Pull Posts:
1. Pipe: 2.875 inches OD, 5.79 pounds per linear foot (Schedule 40).
2. Class B Steel Tubing: 2.875 inches OD, 4.64 pounds per linear foot.

B. Line Posts:
1. Pipe: 2.375 inches OD, 3.65 pounds per linear foot (Schedule 40).

2. Class B Steel Tubing: 2.375 inches OD, 3.11 pounds per linear foot.

2.3 STEEL FABRIC

A. One-piece widths for fence heights up to 12'-0".

B. Chain link, 2 inch mesh, No. 11 gauge;

C. Selvages: Top edge twisted; bottom edge knuckled.

2.4 SWING GATE POSTS

A. Single width of gate 6'-0" to 12'-0" wide or over 10'-0" high:
1. Pipe: 4 inches OD, 9.11 pounds per linear foot (Schedule 40).
2. Class B Steel Tubing: 4 inches OD, 6.56 pounds per linear foot.

2.5 SWING GATE FRAMES

A. Height: 6'-0" - 12'-0", or leaf width exceeding 8'-0":
1. Pipe: 1.90 inches OD, 2.72 pounds per linear foot (Schedule 40).
2. Class B Steel Tubing: 1.90 inches OD, 2.28 pounds per linear foot.

B. Assemble gate frames by welding or with special steel fittings and rivets for rigid connections. Install mid-height horizontal rails on gates over 10 feet high. When width of gate leaf exceeds 10 feet, install mid-distance vertical bracing of the same size and weight as frame members. When either horizontal or vertical bracing is not required, provide truss rods as cross bracing to prevent sag or twist.

2.6 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Rails and Post Braces:
1. Pipe: 1.660 inches OD, 2.27 pounds per linear foot (Schedule 40).
2. Class B Steel Tubing: 1.660 inches OD, 1.84 pounds per linear foot.

B. Fittings and Post Tops: Steel, wrought iron, or malleable iron.
1. Fasteners: Tamper-resistant cadmium plated steel screws.

C. Stretcher Bars: One piece equal to full height of fabric, minimum cross-section 3/16 inch by 3/4 inch.

D. Metal Bands (for securing stretcher bars): Steel, wrought iron, or malleable iron.

E. Wire Ties: Conform to American Steel Wire gauges.
1. For tying fabric to line posts, rails and braces: 9 gauge (.1483 inch) steel wire.
2. For tying tension wire to fabric: 11 gauge (.1205 inch) steel hog rings.

F. Truss Rods: 3/8 inch diameter.

G. Concrete: Portland Cement concrete having a minimum compressive strength of 4000 psi at 28 days.

H. Spiral Paper Tubes:
1. Sonotube by Sonoco Products Co., North Second St., Hartsville, SC 29550, (800) 377-2692.
2. Sleek/tubes by Jefferson Smurfit Corp., P.O. Box 66820, St. Louis, Mo 63166, (314) 746-1100.

I. Cold Galvanizing Compound: Single component compound giving 93 percent pure zinc in the dried film, and meeting the requirements of DOD-P-21035A (NAVY).

2.7 FINISHES

A. Steel Framework:
1. Polyvinyl Chloride (PVC): Black plastic finish, fusion bonded to galvanized metal, minimum thickness 10 mils.

B. Fabric; one of the following:
1. Polyvinyl Chloride (PVC) Finish: Black plastic, fusion bonded to galvanized wire, breaking strength, 1290 pounds, minimum thickness 7 mils.

C. Fence and Gate Hardware, Miscellaneous Materials, Accessories:
1. PVC coated, per manufacturer's standards.

PART 3 EXECUTION

3.1 PREPARATION

A. Clear and grub along fence line as required to eliminate growth interfering with alignment. Remove debris from State property.

B. Do not begin installation of fence in areas to be cut until finished grading has been completed.

3.2 INSTALLATION

A. Space posts equidistant in the fence line with a maximum of 10 feet on center.

B. Setting Posts in Earth: Drill holes for post footings. If existing grade at the time of installation is below finished grade, provide spiral paper tubes to contain concrete to finish grade elevation. Set posts in center of hole and fill hole with concrete. Plumb and align posts. Vibrate or tamp concrete for consolidation. Finish concrete in a dome shape above finish grade elevation to shed water. Do not attach fabric to posts until concrete has cured a minimum of 7 days.

C. Locate corner posts at corners and at changes in direction. Use pull posts at all abrupt changes in grade and at intervals no greater than 500 feet. On runs over 500 feet, space pull posts evenly between corner or end

posts. On long curves, space pull posts so that the strain of the fence will not bend the line posts.

D. Install top rail continuously through post tops or extension arms, bending to radius for curved runs. Install expansion couplings as recommended by fencing manufacturers.

E. Install bottom and intermediate rails in one piece between posts and flush with post on fabric side using special offset fittings where necessary.

F. Diagonally brace corner posts, pull posts, end posts, and gate posts to adjacent line posts with truss rods and turnbuckles.

G. Attach fabric to security side of fence. Maintain a 2 inch clearance above finished grade except when indicated otherwise. Thread stretcher bars through fabric using one bar for each gate and end post and 2 for each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2 inches when a 30 pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches oc. Fasten fabric to steel framework with wire ties spaced 12 inches oc for line posts and 24 inches oc for rails and braces. Bend back wire ends to prevent injury. Tighten stretcher bar bands, wire ties, and other fasteners securely.

H. Position bolts for securing metal bands and hardware so nuts are located opposite the fabric side of fence. Tighten nuts and cut off excess threads so no more than 1/8 inch is exposed. Peen ends to prevent loosening or removal of nuts.
   1. Secure post tops and extension arms with tamper-resistant screws.

I. Install gates plumb and level and adjust for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

J. Restore disturbed ground areas to original condition. Topsoil and seed to match adjacent areas.

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SECTION 329120
TOPSOIL

PART 1 GENERAL

1.1 SUBMITTALS

A. Samples:
1. Topsoil for Testing: In the presence of the Owner's Representative, take a 5 lb sample from each 1000 cu yds of topsoil to be used on the project. Submit to the Owner's Representative the laboratory test results for the organic matter, Ph value, and gradation. These tests will be performed and signed by a certified soils laboratory.

1.2 QUALITY ASSURANCE

A. Topsoil used on this project shall be tested, and approved before placement.

B. Secure approval before stripping topsoil from a borrow area or delivering topsoil to the project site.

PART 2 PRODUCTS

2.1 TOPSOIL

A. Source: Provide topsoil from areas from which no topsoil has been taken previously and from areas which are producing, or have produced fair to good yield farm crops without unusual fertilization for a minimum period of 10 years, or from arable or cultivable areas supplied with good normal drainage.

B. Provide topsoil conforming to the following:
1. Original loam topsoil, well drained homogeneous texture and of uniform grade, without the admixture of subsoil material and entirely free of dense material, hardpan, sod, or any other objectionable foreign material.
2. Containing not less than 4 percent nor more than 20 percent organic matter in that portion of a sample passing a 1/4 inch sieve when determined by the wet combustion method on a sample dried at 105 degrees C.
3. Containing a Ph value within the range of 4.5 to 7.5 on that portion of the sample which passes a 1/4 inch sieve.
4. Containing the following gradations:

SIEVE DESIGNATION	PERCENT PASSING
1 inch	100
1/4 inch	97 - 100
No. 200	20 - 65 (of the 1/4 inch sieve)

2.2 LIMESTONE

A. Provide ground limestone in the producer's standard bags containing not less than 90 percent of calcium and magnesium carbonates equivalent to not less than 45 percent of the mixed oxides of calcium and magnesium and conforming to the following gradations:

SIEVE DESIGNATION	PERCENT PASSING
No. 100	50 - 100
No. 20	100

PART 3 EXECUTION

3.1 PREPARATION

A. Grub out and remove all vegetation in the area of the approved topsoil source.

3.2 SPREADING TOPSOIL

A. Perform topsoil spreading operations only during dry weather.

B. To insure a proper bond with the topsoil, harrow or otherwise loosen the subgrade to a depth of 3 inches before spreading topsoil.

C. Spread topsoil directly upon prepared subgrade to a minimum depth measuring 4 inches after natural settlement in areas to be seeded. In sodded areas the thickness of the topsoil after natural settlement plus the sod shall equal 4 inches. Smooth out unsightly variations, bumps, ridges, and depressions which will hold water. Remove stones, litter, or other objectionable material. Finished surfaces shall conform to the contour lines and elevations indicated on the drawings or fixed by the Owner's Representative.

3.3 SPREADING LIMESTONE

A. Spread ground limestone evenly over the topsoiled surface. Incorporate limestone within the top 2 inches of soil prior to finish raking.

B. Apply limestone at the following rate per 1000 sq ft of topsoil area, corresponding to the hydrogen ion concentration (Ph) shown by the soil chemical analysis:

PH	RATE (pounds)
4.5 to 5.0	150
5.0 to 5.5	100
5.5 to 6.0	50
6.0 to 6.8	25
over 6.8	0

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SECTION 329219
SEEDING

PART 1 GENERAL

1.1 SUBMITTALS

A. Product Data; Hydro Mulch: Manufacturer's specifications and application rate.

B. Product Data; Erosion Control Blanket: Manufacturer's specifications.

C. Sample: One pound of seed in vendor's unopened package with label and seed analysis.

1.2 QUALITY ASSURANCE

A. Provide prepackaged seed readily available to the public with quality and purity equal to product of O.M. Scotts and Son, Marysville, OH. On-the-job or made-to-order mixes will not be accepted.

1.3 DELIVERY STORAGE AND HANDLING

A. Deliver fertilizer in manufacturer's standard size bags or cartons showing weight, analysis, and the name of the manufacturer. Store as approved by Owner's Representative.

B. Store all seed at the site in a cool dry place as approved by the Owner's Representative. Replace any seed damaged during storage.

C. Deliver erosion control blanket in manufacturer's standard packing material, showing the name of the manufacturer. Store as approved by the Owner's Representative.

1.4 SCHEDULING

A. Time For Seeding: Optimum period to sow permanent grass seed is generally between April 1st and May 15th or between August 15th and October 1st. Schedule application for when weather conditions permit or as Directed.
   1. Provide temporary seed and mulch when final grading is complete while waiting for optimal seeding period.
   2. Provide temporary seed and mulch for temporary cover on disturbed ground not to be worked on for more than 7 days.
   3. Provide temporary seed and mulch on disturbed earth prior to temporary shutdown of construction.

PART 2 PRODUCTS

2.1 FERTILIZER

A. Fertilizer: Mixed commercial fertilizers shall contain total nitrogen, available phosphoric acid and soluble potash in the ratio of 10-6-4 (50%

N/UF). 50% of total nitrogen shall be derived from ureaform furnishing a minimum of 3.5% water insoluble nitrogen (3.5% WIN). The balance of the nitrogen shall be present as methylene urea, water soluble urea, nitrate and ammoniacal compounds.

B. Other fertilizers meeting DOT Specification Section 713-03 Fertilizer can be used.

2.2 LAWN SEED

A. Furnish fresh, clean, new-crop seed mixed in the proportions specified for species and variety, and conforming to Federal and State Standards.

B. Acceptable material in a seed mixture other than pure live seed consists of nonviable seed, chaff, hulls, live seed of crop plants and inert matter. The percentage of weed seed shall not exceed 0.1 percent by weight.

C. All seed will be rejected if the label or test analysis indicates any of the following contaminates: Timothy, Orchard Grass, Sheep Fescue, Meadow Fescue, Canada Blue Grass, Alta Fescue, Kentucky 31 Fescue, and Bent Grass.

D. Provide the following seed mixture:

A = Min. Percentage of Germination
B = Min. Purity Percentage
C = Weight Pure Live Seed in Mixture

LAWN SEED MIX

Name	Variety	A	B	C
Chewings Fescue (Festuca rubra commutata)	Banner, Highlight, Jamestown, or an approved equal.	85	97	25
Kentucky Bluegrass * (Poa pratensis)	Barron, Flyking, Glade, or an approved equal.	80	95	55
Perennial Ryegrass ** (Lolium perenne)	Manhatten II, Pennfine, Yorktown II, or an approved equal.	90	98	20

2.3 MEADOW SEED

SEED MIX- MEADOW

Pollinator Seed Mix for Medium Soils, Prairie Nursery, Westfield, WI 800-476-9453 or equal.

Name	Common Name
Bouteloua curtipendula	Sideoats Grama
Schizachyrium scoparium	Little Bluestem

Name	Common Name
Sporobolus heterolepis	Prairie Dropseed
Elymus canadensis	Canada Wild Rye
Agastache foeniculum	Lavender Hyssop
Allium cernuum	Nodding Pink Onion
Asclepias incarnata	Red Milkweed
Asclepias tuberosa - Clay	Butterflyweed for Clay
Aster azureus	Sky Blue Aster
Aster laevis	Smooth Aster
Aster novae-angliae	New England Aster
Coreopsis lanceolata	Lanceleaf Coreopsis
Echinacea pallida	Pale Purple Coneflower
Echinacea purpurea	Purple Coneflower
Eryngium yuccifolium	Rattlesnake Master
Eupatorium purpureum	Sweet Joe Pye Weed
Liatris pycnostachya	Prairie Blazingstar
Liatris spicata	Dense Blazingstar
Monarda fistulosa	Bergamot
Penstemon digitalis	Smooth Penstemon
Ratibida pinnata	Yellow Coneflower
Rudbeckia hirta	Black Eyed Susan
Rudbeckia subtomentosa	Sweet Black Eyed Susan
Rudbeckia triloba	Brown Eyed Susan
Solidago ohioensis	Ohio Goldenrod
Solidago rigida	Stiff Goldenrod
Tradescantia ohiensis	Ohio Spiderwort
Verbena hastata	Blue Vervain
Vernonia fasciculata	Ironweed
Veronicastrum virginicum	Culver's Root
Zizia aurea	Golden Alexanders
Cassia fasciculata	Partridge Pea
Cassia hebecarpa	Wild Senna
Dalea purpurea	Purple Prairie Clover
Cassia fasciculata	Partridge Pea

2.4 MULCH

A. Dry Application, Straw: Stalks of oats, wheat, rye or other approved crops which are free of noxious weeds. Weight shall be based on a 15 percent moisture content.

B. Hydro Application: Colored wood cellulose fiber product specifically designed for use as a hydro-mechanical applied mulch. Acceptable Product: Conwed Hydro Mulch, Conwed Fibers, 231 4th Street SW, Hickory, NC.

PART 3 EXECUTION

3.1 PREPARATION

A. Seed Bed: Scarify soil to a depth of 3 inches in compacted areas. Smooth out unsightly variations, bumps, ridges, and depressions which will hold water. Remove stones, litter, or other objectionable material.
   1. Obtain written approval of seed bed from the Owner's Representative before commencing seeding operations.

3.2 FERTILIZING

A. Apply 10-6-4 fertilizer evenly at the rate of 40 pounds per 1000 sq ft or 2 pounds of nitrogen per 1000 sq ft.

3.3 SEEDING

A. Assume all risks when seed is sowed before approval of seed analysis.

B. Do not seed when the wind velocity exceeds 5 miles per hour.

C. Application Rate:

Lawn Seed:	5 pounds per 1,000 sq. ft.
Meadow Seed:	¼ pound per 1,000 sq. ft.

D. Dry Application: Sow seed evenly by hand or seed spreader on dry or moderately dry soil.

E. Hydroseeding:
   1. Apply seeding materials with an approved hydroseeder.
   2. Fill tank with water and agitate while adding seeding materials. Use sufficient fertilizer, mulch, and seed to obtain the specified application rate. Add seed to the tank after the fertilizer and mulch have been added. Maintain constant agitation to keep contents in homogeneous suspension. Prolonged delays in application or agitation that may be injurious to the seed will be the basis of rejection of material remaining in tank.
   3. Distribute uniformly a slurry mixture of water, seed, fertilizer, and mulch at a minimum rate of 57 gallons per 1000 sq ft (2500 gallons per acre). The Owner's Representative may order the amount of water increased if distribution of seeding materials is not uniform.

3.4 MULCHING

A. Dry Application: Within one day after seeding, cover the seeded areas with a uniform blanket of straw mulch at the rate of 100 pounds per 1000 sq ft of seeded area.

B. Hydro Application: Apply approved mulch in accordance with the manufacturer's written instructions and recommended rates of application.

3.5 LAWN ESTABLISHMENT

A. Maintain the grass at heights between 3 inches and 3-1/2 inches on a weekly basis until the Final Acceptance of the Work.

B. Water and protect all seeded areas until final acceptance of the lawn.

3.6 FINAL ACCEPTANCE

A. Final acceptance of lawn areas will be granted when a uniform stand of acceptable grass is obtained, with a minimum of 95 percent coverage. Portions of the lawn areas may be accepted at various times at the discretion of the Owner's Representative.

B. Unacceptable lawn areas, dry application: Reseed as specified and fertilized at one-half the specified rate.

C. Unacceptable lawn areas, hydro application: Reseed, fertilize, and mulch at one-half the specified rate, use full water rate.

D. At the physical completion of the Work, the State will assume maintenance responsibilities of the lawn areas.

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SECTION 329301
PLANTS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Topsoil: Section 329120.

1.2 REFERENCES

A. Plant Nomenclature: Conform to the latest edition of "Standardized Plant Names" as adopted by the American Joint Committee of Horticultural Nomenclature.

B. Size and Grading Standards: Conform to the current edition of "American Standard for Nursery Stock" - Sponsor - the American Association of Nurserymen Inc., unless otherwise specified.

1.3 SUBMITTALS

A. List of Plants: Before plant material is shipped to the project site, submit a complete itemized list of all plants including the source of supply.

B. Product Data: Furnish the following with each planting material delivery.
1. Invoice indicating sizes and variety of plant material.
2. Certificates of inspection required by State and Federal agencies.
3. Labels for each plant or bundles of plants indicating name and size.

C. Quality Control Submittals:
1. Worker's Qualifications Data: Names and addresses of 5 similar projects that each person has worked on during the past 2 years.

1.4 QUALITY ASSURANCE

A. Worker's Qualifications: The persons performing the planting and their supervisor shall be personally experienced in the planting and caring of plant material and shall have been regularly employed by a company engaged in the planting and caring of plant material for a minimum of 2 years.

B. Caliper trees up to 4 inches in caliber at a point 6 inches above ground and trees over 4 inches in caliber 12 inches above ground.

C. Do not use woody plant material from regions south of latitude 39 degrees unless such material has been lined out in nurseries located north of latitude 39 degrees for at least 2 growing seasons. Latitude 39 degrees is approximately a line from Annapolis, MD to Cincinnati, OH.

1.5 DELIVERY, STORAGE AND HANDLING

A. Notify the Owner's Representative 48 hours in advance of delivery of plant material.

B. Protect plants against climatic and mechanical injuries.

C. Deliver fertilizer in manufacturer's standard sized bags showing weight, analysis, and manufacturer's name. Store under a waterproof cover or in a dry place as designated by the Owner's Representative.

1.6 PROJECT CONDITIONS

A. Water will be furnished by the State from existing facilities as directed. Furnish hoses and connections required to adequately water plants.

1.7 SCHEDULING

A. Plant deciduous, woody plants between October 1 and May 15 whenever temperature is above 32 degrees F and soil is in workable condition, unless otherwise approved in writing.

B. Plant evergreens between August 15 and September 15 or during April or May before start of new growth.

1.8 PLANTING GUARANTEE

A. The guarantee shall extend for a period of one year from the date of physical completion. Physical completion for the Work of this Section is the date or dates when all the planting operations, or seasonal portions of the planting operations, or replacement planting operations have been completed and are accepted by the Owner's Representative.

PART 2 PRODUCTS

2.1 PLANTS

A. Shrubs and Trees:
1. Nursery grown stock unless otherwise indicated in the itemized plant list.
2. Acclimated plants true to genus and species.
3. Well developed root and branch systems. Do not prune branches before delivery.
4. Free of disease, insect eggs, bark abrasions, and disfiguring knots.
5. Buds intact and reasonably closed at time of planting.
6. Balled and burlapped from soil which will hold a natural ball. Manufactured balls are unacceptable.
7. Conform to size indicated or larger, or within the minimum maximum size when so indicated. Larger plants cut back to specified dimensions will not be accepted.

B. Trees:
   1. Single erect leader from ground to top, surrounded with uniformly arranged branches.
   2. Free from frost cracks, broken bark, and dead or broken branches.
   3. Transplanted, or root pruned 360 degrees at least once during the previous 3 years.

2.2 PLANTING SOIL

A. Topsoil for Planting Soil: Obtain from outside sources.

B. Soil Amendments (For every 4 cu yd of topsoil):
   1. Fertilizer: 5 lb.
   2. Bonemeal: 80 lb.

C. In the presence of the Owner's Representative, place the soil amendments over the topsoil piles and turn over the combined elements a minimum of 3 times until thoroughly mixed.

2.3 FERTILIZER

A. Bonemeal: Commercial, steamed finely ground material containing not less than 1.0 percent nitrogen and 11 percent phosphoric acid.

B. Commercial Fertilizer (10-6-4): Containing not less than 10 percent nitrogen, 6 percent available phosphoric acid and 4 percent water soluble potash.

2.4 MULCH

A. Wood Chips: Hardwood or softwood chips produced by a standard wood chipping machine, free of leaves, young green growth, wood shavings, sawdust, or any foreign material. Chips shall not exceed 3 inches in greatest dimension.

2.5 MISCELLANEOUS MATERIALS

A. Tree Wound Paint: Antiseptic, waterproof, adhesive, elastic tree wound paint containing no kerosene, coal tar, creosote, or other material harmful to cambium or living tissue.

B. Anti-desiccants: Wilt-Pruf by Wilt-Pruf Products, Inc., P.O. Box 469, Essex, CT 06426, (203) 767-7033.

PART 3 EXECUTION

3.1 INSPECTION

A. Plants to be approved at the nursery by Owner's Representative prior to being shipped to the site.

B. Do not plant any plant material until after inspection and approval in writing of plant shipments. Secure written approval of any substitutions before planting. Remove rejected material from planting areas.

3.2 PREPARATION

A. Planting Layout:
   1. Stake out tree locations and planting areas.
   2. Obtain layout approval from the Owner's Representative prior to excavations of plant pits and beds.

B. Plant Pit Dimensions: Minimum width 12 inches, measured at the ground surface.
   1. Balled and Burlapped Plants:
      a. Pit Depth: Not to exceed the ball depth.
      b. Pit Width: Measured at the ground surface, 3 times the width of the ball or as indicated.
   2. Container Grown Plants: 2 times the diameter of the container measured at the ground surface.
   3. Ground Cover Beds: Excavate entire bed to a depth of 4 inches.
   4. Bare Root Plants: Diameter equal to width of roots spread to natural position plus 24 inches, measured at the ground surface.
   5. Hedge Trenches: 18 inches wide and 18 inches deep.

C. Excavation: Excavate pits to the dimensions specified. Dispose of excavated material of the site unless otherwise directed.

3.3 PLANTING

A. Setting Plants:
   1. Backfill pits with planting soil and firm to the level upon which plants were previously growing. Set plants plumb. Plant budded or grafted plants 2 inches below bud or graft line. Complete backfilling with planting soil and settle continually with water.
   2. Balled Plants: Set plants in position and backfill 1/3 depth of ball. Remove burlap from top and adjust to eliminate air pockets. Complete backfill and settle with water.
   3. Bare-root Plants: Set plant in position and place planting soil around roots settling with water. Use care to avoid bruising or breaking roots when firming soil. Prune bruised or broken roots.

B. Anti-Desiccant: Apply anti-desiccant spray to broadleaved ericaceous plants planted in the Fall season, as directed.

C. Surface Finish: Form saucer as indicated on Drawings or as directed. Grade soil to form a basin on lower side of slope plantings, which will catch and retain water. Top dress basins with fertilizer spread evenly at the rate of 1-1/2 pounds per square yard of plant pit surface. Break saucers and basins before ground freezes.

D. Mulching:

1. Spread mulch over finished surface of each plant, plant bed and hedge trench in the following amounts:
   a. Wood Chips: 3 inches.
2. Water plants thoroughly after mulching.

E. Pruning: Prune immediately after planting using sharp tools approved by the Owner's Representative. Remove approximately 1/3 of the wood of deciduous plants, maintaining the natural habit of the plant. Cut no leaders. Paint pruning cuts 3 inches in diameter or over with tree wound paint.

F. Establishment of Planting: Maintain plantings immediately following planting operations and continue throughout the guarantee period. Establishment of plantings shall consist of keeping plants in healthy, growing conditions by watering, weeding, cultivating, pruning, spraying, remulching and by any other necessary operations of establishment. Water all plants at least once a week between April 1 and October 31 with approximately 5 gallons per square yard (1 inch layer of water) per watering unless otherwise directed. Provide additional watering during periods of dry weather when required or when directed. Treat plants with good horticultural preventative or remedial measures to control insects, diseases or rodents.

3.4 INSPECTIONS AND REPLACEMENTS

A. The following inspections apply only to this Section and supersede inspections specified in Section 017716.
   1. Physical Completion Inspection and Replacements: Notify the Owner in writing at least ten days prior to requested date of physical completion inspection. Remove and replace dead, unhealthy or badly impaired plants according to the original specification, if so directed. Replace plants during the next planting season if this inspection is not within a planting season.

   2. End of Guarantee Inspection and Replacements: Remove stakes, guy wires and tree wrapping at the end of the one year guarantee period unless otherwise directed. Remove and replace dead, unhealthy or impaired plants according to original specification, as directed. Replace plantings during the next planting season if end of guarantee period is not within a planting season.

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SECTION 329413
LANDSCAPE EDGING

PART 1 GENERAL

1.1 SUBMITTALS

A. Product Data: Catalog cuts, specifications and installation instructions for steel edging.

PART 2 PRODUCTS

2.1 STEEL EDGING

A. Steel Edging: DuraEdge by JD Russell Company, Shelby Township, MI, complete with loops pressed from, or welded to face of sections to receive anchor stakes.
1. Size: 1/4 x 5 inches deep.

B. Anchoring Stakes: Manufacturer's standard 16-inch minimum tapered steel.

C. Finish: Manufacturer's standard green-black painted finish on steel edging and anchoring stakes.

PART 3 EXECUTION

3.1 PREPARATION

A. Lay out edging to outline of planting areas.

B. Neatly cut asphalt or lawn areas as required for steel edging installation.

3.2 INSTALLATION

A. Install steel edging true to line and grades indicated. Set top of edging flush with finished grade.

B. Drive steel stakes through slots punched in steel edging. Set top of stake 1/2 inch min below top of edging.

C. Patch asphalt cut for installation of edging and/or reseed lawn areas. Restore such areas to their original condition.

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SECTION 331101
WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

B. Water Utility Distribution Valves: Section 331216.

C. Disinfection: Section 331300.

1.2 SUBMITTALS

A. Product Data: Manufacturer's specifications including dimensions and coatings.

B. Quality Control Submittals: Statement of compliance with ANSI/AWWA Specifications.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. U.S. Pipe
1101 East Pearl Street
Burlington, New Jersey 08016
(609)387-6122

B. American Pipe
1614-0 Union Valley Road, Suite 304
West Milford, New Jersey 07480
(973)853-4288

C. EBAA Iron Sales, Inc.
P.O. Box 857
Eastland, TX 76448
(800) 433-1716
www.ebaa.com

2.2 DUCTILE IRON PIPE

A. Centrifugally cast, in accordance with ANSI/AWWA C151/A21.51.
1. Working Pressure: 100 psi.
2. Thickness Class: Under 6 inch - 51; 6 inch and larger - 52.
3. Restrained joints: Boltless integral restraining system rated for a working pressure of 350 psi in accordance with the performance requirements of ANSI/AWWA C111/A21.1.
a. Field LOK 350 by U.S. Pipe
b. Flex-Ring by American Pipe
4. Laying Lengths: 18 or 20 feet.

B. Coating and Lining:
   1. Outside Coating: Bituminous enamel, minimum thickness 1 mil.
   2. Inside Lining: Cement mortar; ANSI/AWWA C104/A21.4.

2.3 FITTINGS

A. Compact Ductile Iron Fittings (3 Inch – 64 Inches): ANSI/AWWA C153/A21.53.

B. Joints: Match pipe furnished.

C. Coating and Lining:
   1. Outside Coating: Bituminous enamel, minimum thickness 1 mil.
   2. Inside Lining: Cement mortar; ANSI/AWWA C104/A21.4.

2.4 FLEXIBLE EXPANSION JOINTS

A. Single ball flexible expansion joint designed for protection against bending moments.
   1. EBAA Iron Sales, Inc.

B. Double ball flexible expansion joint designed for protection against shear and ground movement.
   1. EBAA Iron Sales, Inc.

C. Construction:
   1. Manufactured of 65-45-12 ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53.
   2. Working Pressure: 350 psi for flexible joints 3 inch through 24 inch in size; 250 psi for flexible joints 30 inch and over in size.
   3. Expansion joint designed and cast as an integral part of a ball and socket type flexible joint; 4 inch minimum expansion capability.
   4. Each ball and socket capable of at least 15 degrees deflection.
   5. Coating and Lining:
      a. Outside Coating: Coat tar epoxy, minimum thickness 5 mils.
      b. Inside Lining and Seal Contact Surfaces: NSF approved fusion-bonded epoxy conforming to the material requirements of and tested in accordance with ANSI/AWWA C213.
   6. Joints (Mechanical Joint or Flanged Ends): Match joints of pipe furnished.
   7. Pressure tested against its own restraint at rated working pressure.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect pipe and fittings prior to installation to preclude installation of defective materials.

3.2 INSTALLATION

A. General: Unless otherwise shown, or specified, install the Work of this Section in accordance with ANSI/AWWA Standard C600 and the manufacturer's printed instructions.

B. Laying Pipe:
1. Lay pipe to line and grade with joints close and even. Excavate adequate bell holes to facilitate joint assembly and to permit a uniform bearing on undisturbed earth for the pipe barrel. Unless otherwise noted minimum depth of pipe shall be 4'-6" measured from the top of the pipe to the finished or existing grade, whichever is lower.
2. Keep the trench free from water. Do not lay or test pipe in a wet trench.
3. Lay water pipe on a continuously rising grade from low points to high points at service lines, hydrants or air valves.
4. Construct concrete thrust blocks behind bends, tees, caps and plugs, as shown on the drawings. Cast concrete against undisturbed earth and place support so it will not interfere with making joints.
5. Use clamps, tie-rods, lugged pipe, etc., for anchorage when required and as approved.

C. Push-on Joints: Make joints with a rubber ring and sterile lubricant. The materials used shall be free of water, oil, tar, grease or other foreign substances.

D. Mechanical Joints: Conform strictly to the manufacturer's instructions with particular reference to gland alignment and the tightening of the bolts.

E. Cutting: Cut pipe at right angles to the axis with sharp tools. Prepare ends for proper connections. Do not lay cut pipe within three lengths of a bend or the end of a line without written approval.

F. Protecting Pipe:
1. Keep pipe clean from all sediment, debris, packing material and other foreign material.
2. Close all open ends of pipes and fittings securely with removable plugs at end of each work day, during storms, and when the Work is left at any time.

3.3 PRESSURE AND LEAKAGE TESTS

A. Before backfilling, fill pipe with water to expel all air. Conduct as directed concurrent pressure and leakage tests for two hours at 1-1/2 times the specified working pressure. Maximum variation in test pressures shall not exceed plus or minus 5 psi.
1. Test Procedures: ANSI/AWWA C600, Section 5.

B. Pipe installations will be rejected when the additional water required to maintain pressure during the test period, exceeds the allowable leakage in the following formula.

$$L = \frac{SD \times \text{the square root of } P}{148{,}000}$$

in which:

L = allowable leakage in gallons per hour

S = length of pipe line tested, in feet

D = nominal diameter of pipe, in inches

P = average test pressure during the leakage test, psi (gage)

C. All pressure and leakage tests shall be conducted in the presence of the Owner's Representative.

D. Locate and repair or replace all pipe and fittings showing visible leaks. Repeat Pressure and Leakage Tests as specified.

3.4 DISINFECTION

A. Disinfect pipe and fittings in accordance with Section 331300 after completion of pressure and leakage tests.

3.5 CONNECTIONS

A. When other connecting pipe or other connecting structures have not yet been installed, lay pipe to a point where directed and plug or cap the end. Identify the terminal point with a stake extending above ground, marked to indicate size and service. Provide temporary thrust restraint as directed.

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SECTION 331216
WATER UTILITY DISTRIBUTION VALVES

PART 1 GENERAL

1.1 SUBMITTALS

A. Valve Schedule: Submit the valve schedule listing type of valve, manufacturer's model number and size, for each valve type required.

B. Product Data: Catalog sheets and specifications for each valve type and size and all other items required by this Section.

1.2 QUALITY ASSURANCE

A. Provide valves and indicator posts for fireline service that are UL or FM approved and bear visible body markings indicating such approval.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Apco Willamette Valve and Primer Corp., 1420 S. Wright Blvd., Schaumburg, IL 60193, (847) 524-9000.

B. Crane Valve Co., 2129 3rd Ave., S.E., Cullman, AL 35055, (800) 323-3679.

C. Clow Valve Co., 902 South 2nd St., Oskaloosa, IA 52577, (515) 673-8611.

D. DeZurik Corp., 250 Riverside Ave. N., Sartell, MN 56377, (320) 259-2000.

E. Grinnell Corp. (Tyco Valves and Controls Group), 3 Tyco Pk., Exeter, NH 03833, (603) 778-9200.

F. Hammond Valve Corp., 210 Tower St., Prairie Du Sac, WI 53578, (608) 643-2977.

G. Hayward Industrial Products, Inc., Plastics Division, 900 Fairmount Ave., Elizabeth, NJ 07207, (908) 351-5400.

H. Hydra-Stop, Inc., 12601 South Homan Ave., Blue Island, IL 60406, (708) 389-5111.

I. "IPSCO" International Piping Services Co., 2424 Wisconsin Ave., Downers Grove, IL 60515, (630) 435-9500.

J. Jenkins Valve Co., 45 E. Winsor Pkwy., Oceanside, NY 11572, (516) 536-1517.

K. Kennedy Valve Co., 1021 E. Water St., Elmira, NY 14901, (607) 734-2211.

L. L&M/Technaflow Valve Co., (Tyco Valves and Controls Group), 9025 Maya Blvd., Reno, NV 89506, (775) 350-4100.

M. Ludlow-Rensselaer Div., Patterson Pump Co., P. O. Box 790-TR, Toccoa, GA 30577, (706) 886-2101.

N. M&H Valve Co., P. O. Box 2088, Anniston, AL 36202, (256) 237-3521.

O. Milwaukee Valve Co., 2375 S. Burrell St., Milwaukee, WI 53207, (414) 744-5240.

P. Mueller Valve Co., 500 W. Eldorado St., Decatur, IL 62525, (217) 423-4471.

Q. NIBCO, Inc. (Northern Indiana Brass Co.), 1516 Middlebury St., Elkhart, IN 46516, (219) 295-3000.

R. Henry Pratt Co., 401 S. Highland Ave., Aurora, IL 60506, (630) 844-4000.

S. Red Valve Co., Inc., 700 N. Bell Ave., Carnegie, PA 15106, (412) 279-0044.

T. Rodney Hunt Co., 46 Mill St., Orange, MA 01364, (978) 544-2511.

U. Ross Valve Mfg. Co., 6 Oakwood Ave., Troy, NY 12181, (518) 274-0961.

V. Stockham Valve Co. (Crane Valve Group), 2129 3rd Ave. S.E., Cullman, AL 35055, (800) 786-2542.

W. Tyco Valves and Controls, Inc., 9700 W. Gulf Bank Rd., Houston, TX 77040, (713) 466-1176.

X. U. S. Pipe and Foundry Co., Plano, TX 75026, (972) 423-3881.

Y. Victaulic Company, P. O. Box 31, Easton, PA 18044, (610) 559-3300.

Z. Walworth Co., 8383 Commerce Park Dr., Houston, TX 77036, (713) 777-7788.

2.2 VALVES - BASIC CONSTRUCTION

A. Provide valves of first quality, free from all imperfections and defects, with body markings indicating manufacturer and rating. Valve parts of the same manufacturer, size and type shall be interchangeable. Manually operated valves shall open in a counter-clockwise direction, and in general, round ventilated type handwheels shall be provided. All valves that use packing (except butterfly, cone, and ball valves) shall be capable of being packed when wide open and under full working pressure.

B. Provide valves of each type from a single manufacturer.

C. Unless otherwise indicated, provide valves having a minimum operating pressure of 150 psig OWG, factory tested at double the working pressure.

D. Valves less than 3 inches in size shall be all bronze unless otherwise indicated.

E. Valves 3 inches and larger in size shall have iron bodies and bronze trim unless otherwise indicated.

F. Valve ends, unless otherwise indicated, shall be:
1. Threaded or flanged ends in steel and brass piping under 4 inches in size; flanged ends in steel and brass piping 4 inches and larger in size.
2. Brazing or screwed ends with adapters in threadless copper pipe (Type TP).
3. Solder or screwed ends with adapters in copper water tubing.
4. Mechanical joint, rubber ring joint, or flanged joint in cast iron/ductile iron piping to match joints of pipe furnished.
5. Grooved ends to match joints of pipe furnished.

G. Valve flanges shall be of a class to mate with pipe flanges.

2.3 MATERIALS

A. Body:
1. Cast Iron: ASTM A-126 Class B, higher strength cast iron.
2. Ductile Iron: ASTM A-536 Grade 65-45-12.
3. Bronze: For use up to 150 WSP, ASTM B-62; over 150 to 300 psig WSP, ASTM B-61.

B. Stem:
1. Cast Manganese Bronze: ASTM B-584.
2. Cast Silicon Brass: ASTM B-584.
3. Rolled Silicon Brass: ASTM B-98 Alloy D.
4. Rolled Aluminum Bronze: ASTM B-150 Alloy 1.
5. Rolled Manganese Bronze: ASTM B-138 Alloy A (half hard).
6. Naval Brass: ASTM B-21 Alloy A or Alloy C (hard).
7. Silicon Bronze: ASTM B-371 Alloy C69400.
8. Stainless steel, Type 304.

2.4 GATE VALVES

A. Gate Valves 3 Inches and Larger in Size:
1. Design Standard: ANSI/AWWA C509 or ANSI/AWWA C515.
a. Comply fully with either Standard and the following additional requirements.
b. Resilient wedge type with ductile iron body, epoxy coated in conformance with ANSI/AWWA C550, bronze spindle and nut in which the screw operates.
c. Handwheel operators or 2-inch square operating nuts as required.
d. Valves installed inside buildings and pits shall be outside screw and yoke type, unless otherwise noted.
e. Valves buried in the ground shall be non-rising stem.
f. Provide extension stems and guides as required by the location.

2. Acceptable Manufacturers: Clow, Ludlow-Rensselaer, M & H, and Stockham.

2.5 TAPPING VALVES

A. Special valves complete with tapping sleeve and designed so as to allow for their installation onto existing piping without interruption of piping service. Furnish valves similar to the product manufactured by U.S. Pipe and Foundry Co., each complete with valve box.

2.6 VALVE BOXES

A. Cast iron adjustable type box and cover extending from the valve to final grade. Cover of box shall be complete with an indicating arrow cast on it denoting direction of valve opening.

2.7 VALVE KEYS

A. Furnish one steel socket key for each five valves of the same size or less. For each additional five valves of one size or multiple thereof, furnish one additional key. Provide service box keys, for valves less than 3 inches in size with stationary rod, where required by the service or noted. Acceptable Manufacturer: Mueller.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install valves of type and kind as indicated on the drawings, each complete with operator and accessory items as required by the actual location. Size valves the same size as the piping in which they are installed, unless otherwise indicated.

3.2 VALVE BOXES

A. Install a valve box and cover, extending from the valve to final grade, for each gate valve buried in the ground.

*****

SECTION 331219
WATER UTILITY DISTRIBUTION FIRE HYDRANTS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Thrustblocks: Section 033000 or 033001.

B. Earthwork: Section 310000.

B. Pipe: Section 331101.

D. Valves: Section 331216.

1.2 QUALITY ASSURANCE

A. Approved Manufacturers: Clow, or approved equal.

1.3 SUBMITTALS

A. Product Data: Catalog cuts of fire hydrants and appurtenances.

B. Certificate: Furnish written certification indicating the AWWA C-502 required tests on materials and completed hydrants have been accomplished.

PART 2 PRODUCTS

2.1 FIRE HYDRANTS

A. Fire hydrants shall comply with AWWA C-502 including the following:
1. Six inch pipe connections with a 4'-6" minimum depth below finished grade.
2. 5-1/4 inch valve opening.
3. An "arrow" and the word "open" cast in relief on top of hydrant.
4. Stem nuts shall open by turning to the left.
5. Lugs in the bell of the elbow when required for harnessing the hydrant to the main.
6. Minimum 150 psi working pressure.
7. Anti-freezing and equipped with automatic drip valves.
8. Bronze mounted working parts and bronze valve seats.
9. Breakable and easily replaceable barrel and operating system in the event of damage or accident. Main valve shall remain closed and reasonable tight against leakage in the event of damage or accident.
10. One steamer connection and two 2-1/2 inch nozzles complete with caps and chains. Connections and nozzles shall conform to the "Standard for Screw Threads and Gaskets for Fire Hose Connections, NFPA 1963" unless otherwise required to match the

existing hydrants at the Facility or the threads and fittings of the local fire department.

2.2 MISCELLANEOUS MATERIALS

A. Paint: Hydrant manufacturer's standard primer and 2 finish coats of rust inhibitive, high gloss alkyd enamel. Match color of other hydrants at the Facility.

B. Tools: Furnish 2 wrenches to fit fire hydrants. Deliver wrenches to the Owner's Representative.

PART 3 EXECUTION

3.1 SETTING

A. Locate fire hydrants 2 feet from the curb or gutter unless indicated otherwise. Position steamer connections to face the road.

B. Set fire hydrants plumb with steamer and nozzle centerline elevations 19 inches above finished grade, or match gradeline indicated on barrel of hydrants with finished grade. Provide thrust blocks as indicated. Backfill with 4 cubic feet of crushed stone around the waste or drip outlet with 1/2 of the stone below the outlet. Arrange remaining balance of stone around hydrant to prevent damage to the connections from mechanical shock and to insure hydrant stability.

C. Clean and paint all parts of the hydrants showing above the ground with two finish coats of paint.

*****

SECTION 331300
DISINFECTION OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Conform to provisions of AWWA C-651 for water line disinfection. Do not use Tablet Method therein.

B. Conform to provisions of AWWA C-652 for water tank disinfection.

C. Comply with all requirements of the New York State Department of Health for disinfection of potable water lines, valves, hydrants, storage tanks, and appurtenances.

1.2 SUBMITTALS

A. Contract Closeout Submittals:
1. Test Results.

PART 2 PRODUCTS

2.1 DISINFECTANT

A. Chlorine Gas meeting AWWA B301.

B. Hypochlorites meeting AWWA B300.

2.2 TEST KITS

A. High range test kit for chlorine residual (0-200 mg/1) Hach Chemical Co. Model CN-21P.

B. DPD chlorine residual test kit (0-3.5 mg/1) Hach Chemical Co. Model CN-66.

C. Test kits to remain property of the Contractor.

PART 3 EXECUTION

3.1 DISINFECTION - WATER MAINS

A. Flush mains with clear water at a minimum rate of 3.0 fps prior to disinfection.

B. Hypochlorites: Apply solutions to water mains with a gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions.

C. Application (Continuous Feed Method).
1. Connect chlorinator or force pump to water main upstream from point of repair or replacement, or new lines.

2. Proportion application rate of chlorine solution to obtain a minimum concentration of 50 mg/1 of available chlorine. Use high range test kit to determine concentration. See Table 2.

TABLE 2 - QUANTITY OF DISINFECTANT REQUIRED FOR 50 mg/l OF AVAILABLE CHLORINE PER 100 FT. OF PIPE

PIPE DIAMETER (INCHES)	POUNDS		OUNCES			QUARTS	
	Cl GAS	SOLUTION 70%	HYPOCHLORITE 70%	14.7%	5.25%	14.7%	5.25%
2	0.1	0.1	0.2	0.8	2.1	0.1	0.1
4	0.1	0.1	0.6	3.0	8.3	0.1	0.3
6	0.1	0.1	1.4	6.7	18.7	0.2	0.6
8	0.1	0.2	2.5	11.9	33.2	0.4	1.1
10	0.2	0.3	3.9	18.5	51.9	0.6	1.6

3. In the absence of a meter, determine rate either by placing a pitot gage at discharge or by measuring the time to fill a container of known volume. See Table 3.

TABLE 3 - TIME FOR DISINFECTANT TO FLOW THROUGH 100 FT. OF PIPE - MINUTES

PIPE DIAMETER (INCHES)	@ 25 GPM	@ 100 GPM	@ 500 GPM
2	0.7	0.2	0.04
4	2.6	0.7	0.13
6	5.9	1.5	0.3
8	10.5	2.6	0.5
10	16.3	4.1	0.8

4. Continue to apply chlorine solution until it reaches discharge. Check for the presence of chlorine at discharge by adding an orthotolidine reagent. In the presence of chlorine the reagent will turn red.
5. Maintain chlorinated water in the main for a minimum of 24 hours. At the end of this period chlorine concentration shall be at least 25 mg/1. Use high range test kit to determine concentration.
6. Operate all valves and hydrants to insure their proper disinfection.
7. Prevent back flow of super chlorinated water into existing distribution system.

E. Final Flushing:
1. After a 24-hour retention period, flush main until maximum chlorine concentration is 1.0 mg/1. Use DPD chlorine residual test kit.
2. Discharge super chlorinated water in a manner that will not adversely affect plants and animals. Comply with applicable State regulations for waste discharge.

F. Bacteriological Tests: Contact local health units for sampling criteria and procedures. Local health units may have more stringent criteria.

1. Test water main for bacteriological quality before putting pipe into service. A minimum of two successive sets of samples shall be taken at 24-hour intervals. Both sets of samples shall indicate bacteriological safe water before putting the facility in operation. Pay all expenses incurred for testing.
2. Tests shall be conducted by a laboratory approved by the New York State Health Dept.

G. Give all test results to Owner's Representative.
1. Should test results prove any part of the system bacteriologically unsafe, repeat disinfection procedures until satisfactory results are obtained.

*****

SECTION 333104
PLASTIC DRAINAGE PIPE

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

B. Manholes: Section 333913.

1.2 SUBMITTALS

A. Product Data: Manufacturer's specifications with all pertinent information regarding dimensions, fittings and installation instructions.

PART 2 PRODUCTS

2.1 GENERAL

A. Each length of pipe and each fitting shall be marked in accordance with the applicable ASTM Designation.

2.2 DRAINAGE PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings; (6 inches Diameter and Larger): SDR 35 and ASTM D 3034.

B. Plastic Pipe (4 and 6 inches Diameter, Solid and Perforated) for Building Drains, Cleanout Pipes, Discharge Lines, Leaching Fields, Drain Tiles, etc: PVC meeting ASTM D 2729 or SR (Styrene Rubber) meeting ASTM D 2852.

2.3 SOLVENT CEMENTS

A. Solvent cement used for joining plastic pipe and fittings shall meet the following designations for the various types of plastic pipe listed.
1. PVC: ASTM D 2564.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect all pipe and fittings before installation. Remove defective pipe and fittings from the site.

B. Do not backfill before installation is inspected by the Owner's Representative.

3.2 GENERAL

A. Install pipe in accordance with the manufacturer's recommendations and as specified in ASTM D 2321.

B. Join PVC pipe with solvent cemented joints as recommended by ASTM D 2855.

C. Use No. 2 Coarse Aggregate for bedding and backfill to the depth shown on the drawings for perforated pipe.

3.3 INSTALLATION

A. Laying Pipe: Lay pipe to indicated line and grade with a firm uniform bearing for the entire length of the pipe. Excavate sufficient clearance at each bell or coupling to allow uniform bearing along the pipe barrel. Fill excess excavation with suitable material and tamp.

B. Joints:
   1. Wipe inside of sockets and outside of pipe to be jointed, clean and dry.
   2. Install rubber gaskets in accordance with the manufacturer's specifications.

C. Connections:
   1. Make connections to existing manholes by cutting into the floor or bench of the manhole and forming a new channel.

D. Lay perforated pipe on a tamped bed of underdrain filter material.

3.4 LEAKAGE TESTS

A. Prior to backfilling and laying additional pipe, test the first 100 feet of sewer construction for leakage.
   1. Fill the sewer with water and maintain a head two feet above the highest section of Work being tested. Measure the quantity of leakage. When the sewer being tested is constructed in water bearing soil, the leakage test may, at the discretion of the Director's Representative, be made by measuring the quantity of infiltration into the sewer. The allowable leakage or infiltration shall not exceed 10 gallons per 24 hours per inch pipe diameter per 1000 feet of sewer being tested.
   2. If air testing is used, conform to the procedure described in ASTM F1417.

B. Additional leakage tests and a final test shall be performed as directed.

*****

SECTION 333913
MANHOLES AND DRAINAGE STRUCTURES WITH FRAMES AND COVERS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

B. Corrugated Polyethylene Storm Drain Pipe: Section 334104.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

A. Obtain necessary permits from local Authorities. Ascertain and comply with local requirements for materials, construction and restoration of pavement.

1.3 SUBMITTALS

A. Shop Drawings: Show fabrication details and connections to adjacent Work.

B. Product Data: Manufacturer's catalog cuts, specifications, and installation instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Precast Reinforced Concrete Manholes:
   1. Riser Sections: ASTM C 478.
   2. Joints Between Riser Sections-One of the following:
      a. Rubber Gaskets: ASTM C 443.
      b. Butyl Joint Sealant: ConSeal CS-202 by Concrete Sealants, Inc., 8917 S. Palmer Rd., P. O. Box 176, New Carlisle, OH 45344, (513) 845-8776.
   3. Concrete for Precast Units: Air content 6 percent by volume with an allowable tolerance of plus or minus 1.5 percent. Minimum compressive strength of 4,000 psi after 28 days.
   4. Load Rating: AASHTO HS-20 with 30% impact and 130 lb/cf equivalent soil pressure.

B. Precast Reinforced Square and Rectangular Concrete Structures:
   1. Riser Sections: ASTM C890.
   2. Keyed Joints:
      a. Joint Sealant - Select One:
         1) Mortar
         2) Rubber Gasket
         3) Butyl Joint Sealant
   3. Load Rating: AASHTO HS-20 with 30% impact and 130 lb/cf equivalent soil pressure.

4. Concrete for Precast Units: Air content 6 percent by volume with an allowable tolerance of plus or minus 1.5 percent. Minimum compressive strength of 4,000 psi after 28 days.

C. Cast-in-Place Concrete for Manhole Invert Channels: Normal weight, air entrained concrete with a minimum compressive strength of 4,000 psi after 28 days.
   1. Design Air Content: 6 percent by volume plus or minus 1.5 percent.
   2. Cement: Minimum 610 pounds per cubic yard.
   3. Slump: Between 2 and 3 inches.

D. Drop Piping:
   1. Inside Drop:
      a. Polyvinyl Chloride Pipe: PVC compound ASTM D1784, Pipe ASTM D-3034, SDR-26.

E. Frames, Covers and Grates for Manholes and Catch Basins:
   1. Design of each shall be the same throughout the project unless otherwise specified or indicated on the drawings.
   2. Units shall meet AASHTO H20 wheel loading requirements. Manufacture, workmanship and certified proof-load tests shall conform to AASHTO M306-89-Standard Specification for Drainage Structure Castings.
   3. Material:
      a. Cast iron: ASTM A48, Class 30B or 35B.
      b. Delivered to Site free of any coatings, unless otherwise specified.
   4. Frames:
      a. Round with a 30-inch clear opening.
   5. Covers:
      a. Round.
      b. Solid lid, top surface checkered and provided with suitable concealed lifting notches, and lettering cast into cover to indicate type of structure.
   6. Grates:
      a. Round.
      b. Minimum open area: 232 sq inches.
      c. Bicycle safe.
   7. Acceptable Manhole Frames and Covers: Pattern R-1557-A with platen cover by Neenah Foundry Company, P. O. Box 729, Neenah, WI 54957, (414) 729-3661; Pattern 1016A with platen cover by Syracuse Castings Sales Corp., P. O. Box 190, South Bay Rd., Cicero, NY 13039, (315) 699-2601.
   8. Acceptable Catch Basin Frames and Gratings: Pattern R-2557-A frame with Pattern R-2580-A, Type G grate by Neenah Foundry Company, P. O. Box 729, Neenah, WI 54957, (414) 729-3661; Pattern 1187A frame with grate by East Jordan Iron Works, P.O. Box 190, South Bay Rd., Cicero, NY 13039, (315) 699-2601. Corporate Headquarters, 301 Spring Street, East Jordan, MI 49727, (800) 874-4100.

F. Pipe-to-Manhole/Drainage Structure Connections-One of the following:
   1. A-Lok Flexible Connector by A-Lok Products, Inc., 697 Main St., Tullytown, PA 19007, (215) 547-3366.
   2. Lockjoint Flexible Connector by Chardon Rubber Company, 373 Washington St., Chardon, OH 44024, (216) 285-2161.
   3. Kor-N-Seal Flexible Connector by NPC, Inc., 250 Elm St., Milford, NH 03055, (601) 673-8680.
   4. Link-Seal Flexible Connector by Thunderline Link-Seal, Inc., 6525 Goforth St., Houston, TX 77021, (713) 747-8819.

G. Mortar: ASTM C 270, Type M.

PART 3 EXECUTION

3.1 PREPARATION

A. Sewer Lateral Openings in Precast and Cast-in-Place Concrete Risers: Provide openings and install pipe connectors in strict accordance with the recommendation of the connector manufacturer.

3.2 INSTALLATION

A. Construct concrete structures with precast reinforced riser sections to the dimensions shown. Seal joints between precast riser sections with material specified.
   1. Wall thickness for circular structures 12 feet deep or less: 5 inches.
   2. Wall thickness for circular structures greater than 12 feet deep: 6 inches.

B. Position tops of structures flush with finished grade.

C. Form inverts in manholes on straight runs by the use of channel pipe. Form inverts in manholes at changes in direction or grade by making curved channels of concrete. Channels shall have a smooth surface free from irregularities.

D. Cut laterals which will enter above the invert to correct length before installation. Do not cut after installation. Construct drops as shown.

E. Construct drop inlets of concrete or precast units.

*****

SECTION 33 4100
STORM UTILITY DRAINAGE BASINS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 31 0000.

1.2 SUBMITTALS

A. Product Data: Manufacturer's specifications with all pertinent information regarding dimensions, fittings and installation instructions.

PART 2 PRODUCTS

2.1 GENERAL

A. Each length of pipe and each fitting shall be marked in accordance with the applicable ASTM Designation.

2.2 PVC AREA DRAINS

A. PVC Area Drains:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - "Nyloplast" as manufactured by ADS, 4640 Trueman Blvd., Hillard, OH, 43026, (800) 821-6710
      - Or approved equivalent.
   2. Description: Surface area drain system, PVC pipe stock reformed utilizing a thermo-molding process with specified inlet and outlet pipe connection stubs (12") and risers sized to fit specified frame and grate.
   3. Joints: Fabricated fittings shall conform to ASTM D3212 for watertight connections.

B. Frames and Grates: ASTM A536 grade 70-50-05, ductile iron, H-20 rated, painted black, manufactured to specified PVC riser fitting.
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - "Nyloplast" as manufactured by ADS, 4640 Trueman Blvd., Hillard, OH, 43026, (800) 821-6710
      - Or approved equivalent.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect all area drains and fittings before installation.

B. Do not backfill before installation is inspected by the Engineer.

3.2 **PVC AREA DRAIN INSTALLATION**

A. Install type of drains in locations indicated.

B. Fasten grates to drains if indicated.

C. Set drain frames and covers with tops flush with finish surface.

D. Install per manufacturers recommendations.

*****

SECTION 334104
CORRUGATED POLYETHYLENE STORM DRAIN PIPE

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

1.2 SUBMITTALS

A. Product Data: Manufacturer's specifications (AASHTO M-252 or AASHTO M-294), including dimensions, allowable height of cover information, and installation instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Advanced Drainage Systems, Inc., 3300 Riverside Dr., Columbus, OH 43221; (614) 457-3051.

B. Hancor, Inc., 401 Olive St., Findlay, OH 45840; (800) 847-5880.

2.2 MATERIALS

A. Corrugated Polyethylene Pipe (Smooth Interior): Conform to AASHTO M-294 (4 to 36-inch diameter).
1. Coefficient of Roughness (interior pipe surface): 0.012 maximum (Manning formula).
2. Classification: Type S.
3. Minimum Pipe Stiffness Values:

DIAMETER	PIPE STIFFNESS (PER ASTM D 2412)
4", 6", 8", 10", 12"	50 psi
15"	42 psi
18"	40 psi
24"	34 psi
30"	28 psi
36"	22 psi

4. Joint Couplings: Polyethylene Couplers; snap-on type or split collar through 24-inch diameter, screw-on type where applicable.
   a. Corrugated to match pipe corrugations, width not less than one half pipe diameter.
   b. Split couplings shall engage an equal number of corrugations on each side of the joint.
5. Joint Couplings: Polyethylene, bell-and-spigot type couplers utilizing an elastomeric gasket conforming to ASTM F 477.

C. Fittings:
   1. High density polyethylene meeting the properties specified for the pipe.
   2. Either molded or fabricated.
   3. Designed specifically for the pipe furnished and manufactured by the pipe manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Laying: Lay pipe to indicated line and grade with a firm uniform bearing for the entire length of the pipe. Fill excess excavation with suitable materials and tamp.

B. Joints: Install coupling and fasten per manufacturer's instructions.

C. Connections:
   1. Make connections to existing pipe by using a galvanized steel "dimple"-type coupling. Remake damaged existing joints.
   2. Make connections to existing manholes and drainage structures by cutting into the floor or bench of the manhole or drainage structure and forming a new channel.
   3. If the pipe, manholes or other structures with which connections are to be made have not yet been installed, install the pipe to a point directed by the Owner's Representative and plug or cap the end in a satisfactory manner.

*****

SECTION 344113
TRAFFIC SIGNS

PART 1 GENERAL

1.1 SUBMITTALS

A. Shop Drawings: Show shop drawings, not necessarily to scale, but sufficient enough in detail to show color, wording, lettering size and style, overall sign size, construction details and installation details for each type of sign.

PART 2 PRODUCTS

2.1 TRAFFIC SIGNS

A. Construction Materials: Comply with the applicable requirements of DOT Section 645.

B. Posts: Galvanized steel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect signs in their designated locations, as indicated and in accordance with the approved shop drawings and the applicable requirements of DOT Section 645.

B. Protect surfaces and finishes from abrasion and other damage during handling and installation.

C. Replace damaged or faulty signs.

*****

SECTION 347113
VEHICLE GUIDE RAILS

PART 1 GENERAL

1.1 REFERENCES

A. Standards: Comply with the following unless otherwise specified or indicated on the Drawings:
   1. Timber: American Softwood Lumber Standard PS 20 by the U.S. Department of Commerce. Comply with applicable provisions for each indicated use.
   2. Grading Rules:
      a. Douglas Fir, Western Larch, and other Western Woods: Western Wood Products Association (WWPA) or West Coast Lumber Inspection Bureau (WCLIB).
      b. Southern Pine: Southern Pine Inspection Bureau (SPIB).
   3. Preservative Treatment: American Wood Preservers' Association (AWPA) and American Wood Preservers Bureau (AWPB) Standards, quality control methods, and inspection requirements.

1.2 SUBMITTALS

A. Shop Drawings: Show application to project. Include joint and connection details and erection drawings.

B. Quality Control Submittals:
   1. Preservative Treatment Certificates: Certification by treating plant stating chemicals and process used, net amount of chemical preservative retained, and conformance with specified standards.

1.3 QUALITY ASSURANCE

A. Mill and Producers Mark: Each piece of timber shall be grade stamped indicating type, grade, mill, and grading agency certified by the Board of Review of the American Lumber Standards Committee. Mark shall appear on unfinished surface, or ends of pieces with finished surfaces.
   1. Preservative Treated Material: AWPB quality mark on each piece of timber indicating treatment.

PART 2 PRODUCTS

2.1 WOOD POSTS AND RAILS

A. Dressing: Provide timber which has been dressed on 4 sides (S4S) at the mill, prior to grading. Comply with grade sizes.

B. Timber Species: Pressure treated hardwood to conform with AWPB LP-22 for 0.04 preservative retention.
   1. Posts: 8" x 8"
   2. Rails: 4" x 8"

C. Preservative Treatment: Pressure treat fabricated wood members in accordance with the following applicable AWPA Standards:
   1. UCS Code: UC4B

2.2 HARDWARE

A. Steel Shapes and Plates: ASTM A 36.

B. Bolts and Nuts: ASTM A 307.
   1. 1/2" carriage bolts, 13" +/- long w/ nut
   2. Hot dipped galvanized steel

C. Galvanized Finish: ASTM A 153.

PART 3 EXECUTION

3.1 INSTALLATION

A. Wood Posts and Rails: Where treated members must be cut during erection, apply a heavy brush coat of the same treatment solution to the cut surfaces in accordance with AWPA Standard M4.

B. Posts:
   1. Wood: Excavate and set wood posts in 3,000 psi concrete as indicated on the drawings.

C. Rails: Attach to posts as indicated with the alignment resulting in a smooth continuous rail.

*****

SECTION 347115
STEEL PIPE BOLLARDS

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 310000.

1.2 SUBMITTALS

A. Product Data: Manufacturer's name, specifications, and installation instructions,
for each item specified.

B. Shop Drawings: Show installation details.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Pipe: Standard weight, Schedule 40, black or galvanized; ASTM A 53 or ASTM A 135.

B. Carbon Steel Pipe: Standard weight, Schedule 40, black; ASTM A 36.

C. Concrete: Normal weight 4000 psi, air entrained 6 percent plus or minus 1 percent. Mix in accordance with Method No. 1, 6 bags per cu yd min, allowable slump 2 to 4 inches.

D. Bumper Post Sleeve: Model 1737 by Eagle Manufacturing Company, 2400 Charles Street, Wellsburg, WV 26070, (304) 737-3171, www.eagle-mfg.com.
1. Color: Yellow.

E. Manual Retractable Bollards:
a. Diameter: 6"
b. Cap Style: Reveal
c. Material: Carbon Steel
d. Coating: Powder coat, color as selected by the Owner

PART 3 EXECUTION

3.1 STEEL PIPE INSTALLATION

A. Set pipe in center of hole and brace plumb.

B. Fill annular space around pipe with concrete.

C. Remove braces after concrete has set.

D. Install bumper post sleeve in accordance with the manufacturer's printed instructions.

F. Install two Torx center pin security machine screws at the base of the bumper post sleeve to fasten sleeve to steel pipe.

3.2 CARBON STEEL PIPE INSTALLATION

A. Install assisted lift manual retractable bollards per the contract drawings and the manufacturer's instructions.

*****

APPENDIX A

PRE-RENOVATION SURVEY

FOR

ASBESTOS-CONTAINING MATERIALS AND POLYCHLORINATED BIPHENYLS IN CAULK

FOR THE

DEYO HALL RENOVATION
DASNY PROJECT #341830

AT

STATE UNIVERSITY COLLEGE AT NEW PALTZ
NEW PALTZ, NEW YORK

MARCH 2018

PREPARED FOR:

Architecture +
297 River Street
Troy, New York

FOR SUBMISSION TO:

DASNY
515 Broadway
Albany, New York

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WATTS
ARCHITECTURE &
ENGINEERING

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1.0 – EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

Watts Architecture & Engineering (Watts) was retained by Architecture+ to perform a pre-renovation survey for asbestos-containing materials (ACM) and polychlorinated biphenyls (PCBs) in caulks and sealants at Deyo Hall at the State University of New York (SUNY) College at New Paltz. The purpose of the survey was to determine the presence, location and quantity of ACM and PCBs in caulk and sealants throughout the interior and exterior areas of the building that may be disturbed during the planned renovation project. Watts also conducted visual observations for mold growth during the site walkthrough. This survey includes the prior survey data of Deyo Hall performed by Watts Architecture and Engineering in January 2009.

The field survey was conducted in January, 2018 and included the following:

- A visual site inspection to identify suspect ACM and PCBs in the areas of the building that will be impacted by the project. The scope of the survey was based on information provided in the renovation drawings provided by Architecture+.
- Collection and laboratory analysis of samples for asbestos and PCBs in caulk from each identified suspect material.
- Documentation of asbestos and PCB sample locations on drawings and chain-of-custody forms.
- Visual observations for mold growth within the building.

ASBESTOS-CONTAINING MATERIALS

The inspection included the collection and analysis of fifty-three (53) bulk samples representing twenty-four (24) different materials. The prior survey done by Watts Architecture and Engineering in 2009 consisted of one-hundred sixty-four (164) bulk samples, with five (5) being positive for asbestos. An ACM is defined as any material containing more than one percent of asbestos. Based on review of the prior survey data, and the laboratory analysis and visual observations from this survey event, the following ACMs have been identified:

- Black tar vapor barrier on exterior foundation wall (approximately 300 SF within the project limits). This material is non-friable and in good condition;
- Black window glazing compound on interior windows (approximately 34 windows/500 LF/10.5 SF). This material is non-friable and in good condition;
- White insulation in wooden fire doors (approximately 12 doors 252 SF). This material is friable and in good condition;
- Incandescent light fixture wire insulation (approximately 110 fixtures/1,100 LF/36 SF). This material is non-friable and in good condition;
- Brown insulation pin mastic on basement mechanical room ductwork and associated contaminated fiberglass insulation (approximately 200 SF mastic and insulation). This material is non-friable and in good condition;

- Hot water tank insulation in basement mechanical room (approximately 450 SF on one tank). This material is friable and in good condition;
- Mudded fittings throughout building (approximately 500 fittings/500 LF). This material is friable and in good condition;
- Spray-on acoustical ceiling texture (approximately 29,000 SF). This material is friable and in good condition;
- 9"x9" floor tile and mastic in residential suites (approximately 27,300 SF). This material is non-friable and in good condition;
- Residual mastic beneath carpet, vinyl composite floor tile, and epoxy paint where mastic was encapsulated with Mapei® thinset following 2006 removal of 9"x9" floor tile removal in these areas) (approximately 10,000 SF). This material is non-friable and in good condition;
- Buried 18" diameter transite duct (assumed ACM) below basement floor slab (approximately 200 LF within the project limits). This material is assumed to be non-friable and in good condition; and
- Pipe flange gaskets (assumed ACM) on mechanical system piping in the basement mechanical room (approximately 18 pipe flange gaskets/9 SF within the project limits). This material is assumed to be non-friable and in good condition.

The following materials have been tested by Watts as part of this investigation and have been determined to **not** be ACM:

- White thinset mortar behind bathroom ceramic wall tile
- White sink undercoating
- Beige carpet mastic
- Beige window caulk
- Coal tar patch foundation
- Brown interior window glazing compound
- Grey interior window glazing compound
- White control joint caulk
- Black cardboard gasket for 12" square flush maintenance light
- Black roof tar
- Coal tar and felt pad vapor barrier
- Reddish/tan counterflashing caulk
- White door caulk
- Grey masonry control joint caulk
- Brittle black caulk between late entrance panels

- Brown door caulk
- Brown masonry control joint caulk
- 1'x1' cellulose ceiling tile
- Brown fiberboard ceiling panels

Sampling and Laboratory Methodology

A NYSDOL-certified asbestos inspector from Watts collected bulk samples of all suspect ACM that was identified in the building. Bulk samples were collected using simple hand tools from each matrix identified as a potential ACM.

Samples were delivered with the proper chain-of-custody forms to AmeriSci, a New York State accredited laboratory that is a participant in the Environmental Laboratory Approval Program (ELAP) and National Voluntary Laboratory Approval Program (NVLAP). All materials, except non-friable organically bound (NOB) materials and ceiling tiles, were analyzed using Polarized Light Microscopy (PLM) using ELAP Method 198.1. Ceiling tiles and NOBs, which include but are not limited to, mastics, window caulks, and floor tiles underwent gravimetric reduction prior to being analyzed by PLM 198.6 All samples that were negative after PLM 198.6 were further analyzed by Transmission Electron Microscopy (TEM) under ELAP Method 198.4. The New York State Department of Health (NYSDOH) protocol requires analysis by TEM if the PLM analysis does not confirm the presence of asbestos.

It is the belief of Watts that this investigation has identified all reasonably accessible suspect ACMs that will be disturbed by this project. If additional suspect materials are identified during the construction period that have not been previously sampled or sampled as part of this assessment, samples of each material should be collected and analyzed for asbestos content. It should be noted that the roof was not included in the scope of this survey.

POLYCHLORINATED BIPHENYLS

Watts investigated caulks and sealants at Deyo Hall to determine if polychlorinated biphenyls (PCBs) were present and will be impacted by the rehabilitation project. Samples were collected from representative locations identified by Watts based on visual observations made at the time of the site visits.

The purpose of the laboratory testing was to determine if the caulks and sealants contained PCBs and subsequent proper handling and disposal procedures to be followed by the Contractor. A total of eleven (11) materials were identified and sampled from the building during this sampling effort, in addition to four (4) materials identified and sampled during Watts' prior survey completed in January 2009. The samples collected during this effort were analyzed by Schneider Laboratories Global, Inc. (SGL) in Richmond, Virginia. SGL is a New York State Department of Health (NYSDOH) approved laboratory and a participant in the National Voluntary Laboratory

Approval Program (NVLAP). The samples were analyzed using USEPA SW-846 Method 8082, PCBs.

The Environmental Protection Agency (EPA) regulates PCBs and considers any debris generated from construction materials manufactured with PCBs derived from building renovation projects with a concentration of greater than 50 parts per million (ppm) as PCB bulk product waste. The Toxic Substances Control Act (TSCA) regulations (40 CFR Part 761) prescribes requirements for the proper management of PCB materials, including their handling and disposal. PCB bulk product waste at concentrations >50 ppm must follow specific storage, transport, and disposal requirements.

Based on review of the prior survey data, and the laboratory analysis and visual observations from this survey event, the following materials contained PCBs in excess of 50 ppm:

- Beige window caulk on eight 8 exterior windows (approximately 128 LF);
- Brown window glazing compound on interior windows (approximately 500 LF);
- White bathroom floor expansion joint caulk (approximately 500 LF);
- White door caulk (approximately 42 LF);
- Brown door caulk (approximately 268 LF);
- Grey masonry control joint caulk (approximately 70 LF); and
- Brown masonry control joint caulk (approximately 70 LF).

The following materials were non-detect for PCBs, or contained PCBs with concentrations less than 50 ppm:

- Black interior window glazing compound;
- Grey interior window glazing compound;
- Reddish/tan counterflashing caulk;
- Brittle black slate panel;
- White interior door caulk;
- Brown interior door caulk;
- Slop sink caulk; and
- Interior expansion joint caulk.

Floor plan drawings indicating room locations and approximate bulk sample location, chain-of-custody forms, laboratory results, laboratory accreditation, consultant's certifications and license are included in this report. Refer to the appropriate sections for this information.

GENERAL NOTES AND OBSERVATIONS

Deyo Hall, built in approximately 1967, is a three-story plus basement dormitory building constructed of masonry with brick exterior, and is nearly identical to several other dormitory buildings, including the recently renovated Crispell, Bevier, and Lefevre Halls. Deyo Hall has residential suites on the basement and floors 1 through 3, and commons areas including a recreation room, laundry room, and computer room on the basement level, and a lounge, and front office area on the 1st floor. The Resident Director's apartment, a fiber hub room, a computer room, an electrical room, a custodial office, recycling room, and boiler/mechanical room are also located in the basement, while Resident Director and Resident Advisor offices are located on the 1st floor. The residential suites typically consist of 2, 3, or 4 bedrooms sharing a lounge and bedroom. There are three stairwells all serving the basement and floors 1 through 3; one central and one each at the north and south ends of the building. The building is heated via steam to unit heaters located in bedrooms, bathrooms, and common areas throughout the building.

The scope of the survey included the interior areas throughout the building, and the exterior building envelope, including the windows and roof. As discussed above, numerous ACMs were identified throughout the building; the spray-on acoustical ceiling texture and the 9" x 9" vinyl floor tile and mastic being the most significant.

Watts was also informed that a prior flooring replacement project conducted in 2006 included the removal and replacement of asbestos-containing floor tiles from throughout the recreation room and corridors/commons areas, but did not include the removal of the underlying asbestos-containing floor tile mastic, which was encapsulated under a minimum 1/8" Mapei® thinset mortar . This was confirmed by sampling and positively identifying asbestos-containing floor tile mastic below non-original 12"x12" vinyl composite tile (VCT).

2.0 – ASBESTOS-CONTAINING MATERIALS

2.0 ASBESTOS-CONTAINING MATERIALS

This section includes information on all suspect ACM sampled. This section contains the following: a Homogeneous Materials List containing the homogeneous materials identified, their corresponding sample numbers and whether or not they are ACM, as well as drawings identifying the approximate locations of asbestos bulk samples.

This section also includes a summary of the identified ACM. Watts utilized the existing room numbers within the building. Each functional space is listed in the table which lists the identified ACM. For each functional space, all ACM that was identified within that space has been inspected in order to determine its approximate quantity, condition, and whether it is friable or non-friable. Refer to the sample location drawings for identifying room numbers.

Where possible, Watts visually inspected the identified ACM to assess its condition. The condition of the ACM was classified as good, fair or poor. The requirement for each designation is as follows:

Good - Material with no visible damage or deterioration or showing very limited damage or deterioration.

Fair - The surface of the material is crumbling, blistering, water-stained, gouged, punctured or otherwise damaged with the damage covering less than one tenth of the surface if the damage is evenly distributed or up to 25% of the material if the damage is localized.

Poor - The surface of the material is crumbling, blistering, water-stained, gouged, punctured or otherwise damaged with the damage covering more than one tenth of the surface if the damage is evenly distributed or more than 25% of the material if the damage is localized. Material with large areas hanging from the substrate, delaminated, heavily gouged, crushed, etc.

HOMOGENEOUS MATERIALS LIST
RENOVATE DEYO HALL
STATE UNIVERSITY COLLEGE AT NEW PALTZ
DASNY PROJECT NO. 341830

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
White thinset mortar behind bathroom ceramic wall tile	Oasis bathroom G-13 Suite 104 Suite 113 Suite 202 Suite 222 Suite 311 Suite 324	M	17171-1 17171-2 17171-3 17171-4 17171-5 17171-6 17171-7	0.5% Chrysotile NAD 0.3% Chrysotile 0.5% Chrysotile 0.5% Chrysotile 0.8% Chrysotile 0.5% Chrysotile	Chrysotile Trace Chrysotile Trace Chrysotile Trace Chrysotile Trace Chrysotile Trace Chrysotile Trace Chrysotile Trace	N
White sink undercoating	RD Kitchen G-14 Oasis Kitchen G-13	M	17171-8 17171-9	NAD NAD	NAD NAD	N
Beige carpet mastic	RD Suite G-14 Oasis Suite G-13	S	17171-10 17171-11	NAD NAD	NAD NAD	N
Beige window caulk	Basement rec. room - south side Basement – oasis suite – west side	M	17171-12 17171-13	NAD NAD	NAD NAD	N
Coal tar pitch foundation vapor barrier	North side east hall 8" below grade	M	17171-14 17171-15	NAD NAD	NAD NAD	N
Black tar on foundation wall (random application)	**North side – above grade South side near back entrance**	**M**	**17171-16 17171-17**	**9.3% Chrysotile NAD**	**NA NAD**	**Y**
Brown interior window glazing compound	Interior corridor/lobby side window	M	17171-18 17171-19	NAD NAD	NAD NAD	N
Black interior window glazing compound	**Lobby/lounge interior window**	**M**	**17171-20 17171-21**	**3.1% Chrysotile 2.6% Chrysotile**	**NA NA**	**Y**
Grey interior window glazing compound	Lobby/lounge interior window	M	17171-22 17171-23	<0.25% Chrysotile <0.25% Chrysotile	Chrysotile Trace Chrysotile Trace	N
White control joint caulk - flooring	Janitor Closet 209 Janitor Closet 308	S	17171-24 15076-25	NAD NAD	Chrysotile Trace Anthophyllite Trace	N
White fire door insulation (wooden doors)	**Center stairwell 2nd floor door Center stairwell 3rd floor door**	**T**	**17171-26 17171-27**	**8.5% Chrysotile 11.0% Chrysotile**	**NA NA**	**Y**
Incandescent light fixture wire insulation	**Bathroom 128 – white wire Bathroom 128 – brown wire**	**T**	**17171-28 17171-29**	**28.2% Chrysotile 23.5% Chrysotile**	**NA NA**	**Y**
Black cardboard gasket for 12" square flush maintenance light	Bathroom 128 (lobby, men's visitors)	M	17171-30 17171-31	NAD NAD	NA NA	N
Black roof tar (patches/spots)	Copper parapet wall next to hatch) Side of round skylight framing	M	17171-32 17171-33	<0.25% Chrysotile NAD	Chrysotile Trace NAD	N
Coal tar and felt pad vapor barrier	Roof – east/2 near square vent Roof – west/2 north of elevator shaft	M	17171-34 17171-35	NAD NAD	NAD NAD	N
Reddish/tan counterflashing caulk	North side of elevator penthouse South side of elevator penthouse	M	17171-36 17171-37	NAD NAD	NAD NAD	N

HOMOGENEOUS MATERIALS LIST
RENOVATE DEYO HALL
STATE UNIVERSITY COLLEGE AT NEW PALTZ
DASNY PROJECT NO. 341830

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
White door caulk	Front entrance vestibule outer door Front entrance vestibule inner door	M	17171-38 17171-39	NAD NAD	NAD NAD	N
Grey masonry control joint caulk	Slate/brick joint E. of front entrance Slate/brick joint W. of front entrance	M	17171-40 17171-41	NAD NAD	NAD NAD	N
Brittle black caulk between slate entrance panels	Soffit above front door Slate panels west of front entrance	M	17171-42 17171-43	NAD NAD	NA Anthophyllite Trace	N
Brown duct insulation pin mastic	**Mechanical equipment room**	**M**	**17171-44 17171-45**	**31.6% Chrysotile 25.6% Chrysotile**	**NA NA**	**Y**
Brown door caulk	Rear center door (exterior) East ground floor stairwell door	M	17171-46 17171-47	NAD NAD	NAD NAD	N
Brown masonry control joint caulk	Rear brick/brick joint west of entrance Brick/brick joint above rear entrance	M	17171-48 17171-49	NAD NAD	NA NA	N
1'x1' cellulose ceiling tile	Corridor outside elec. room Ground floor corridor at rear door	M	17171-50 17171-51	NAD NAD	NA NA	N
Brown fiberboard ceiling panels	Ceiling of electric room	M	17171-52 17171-53	NAD NAD	NAD NAD	N

Abbreviations:

NA - Not analyzed.
NA/PS – Not analyzed/positive stop.
NAD – No asbestos detected.

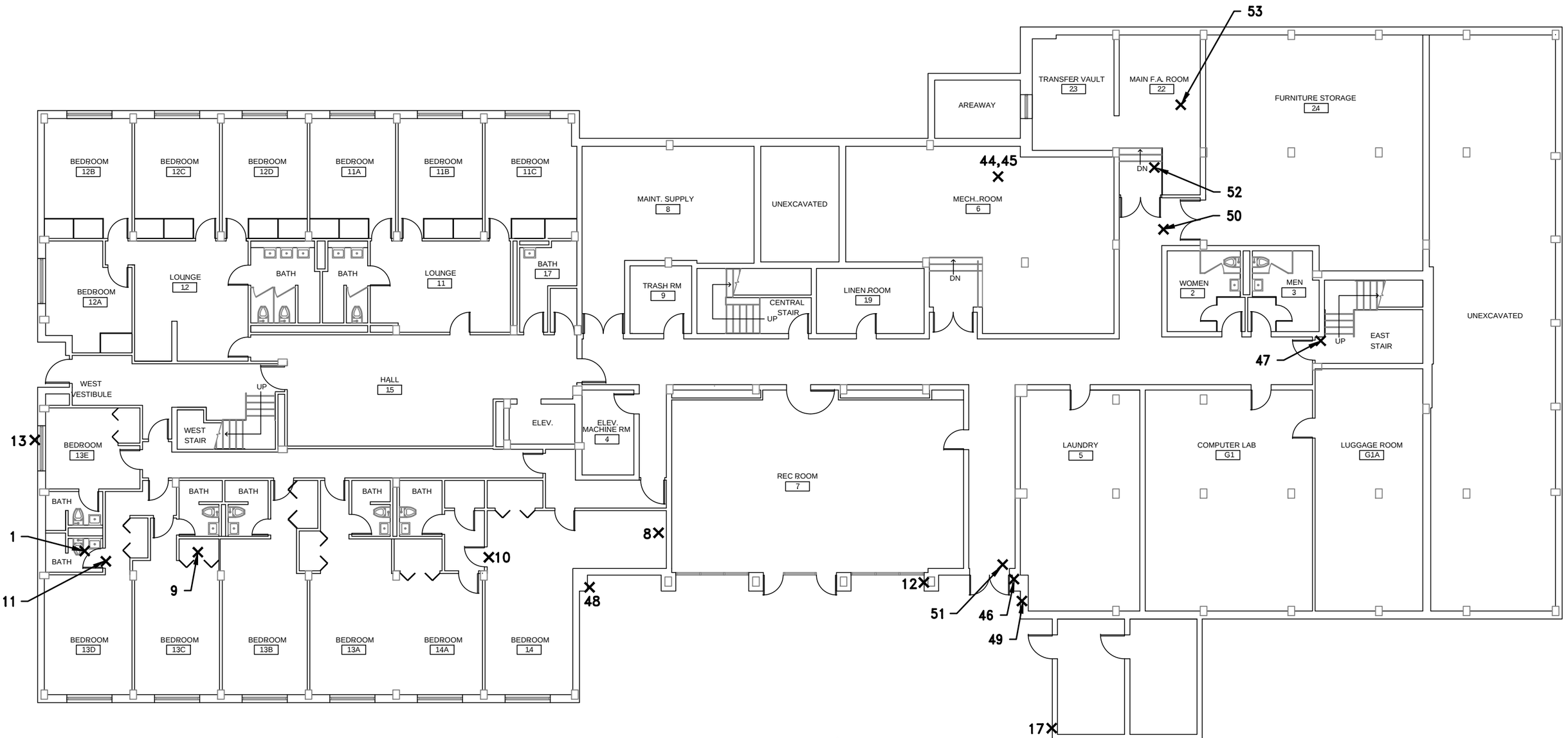
Type

T = Thermal
S = Surfacing
M = Miscellaneous

ACM

Y = Yes
N = No

2.1 – ASBESTOS SAMPLE LOCATION DRAWINGS



BASEMENT PLAN

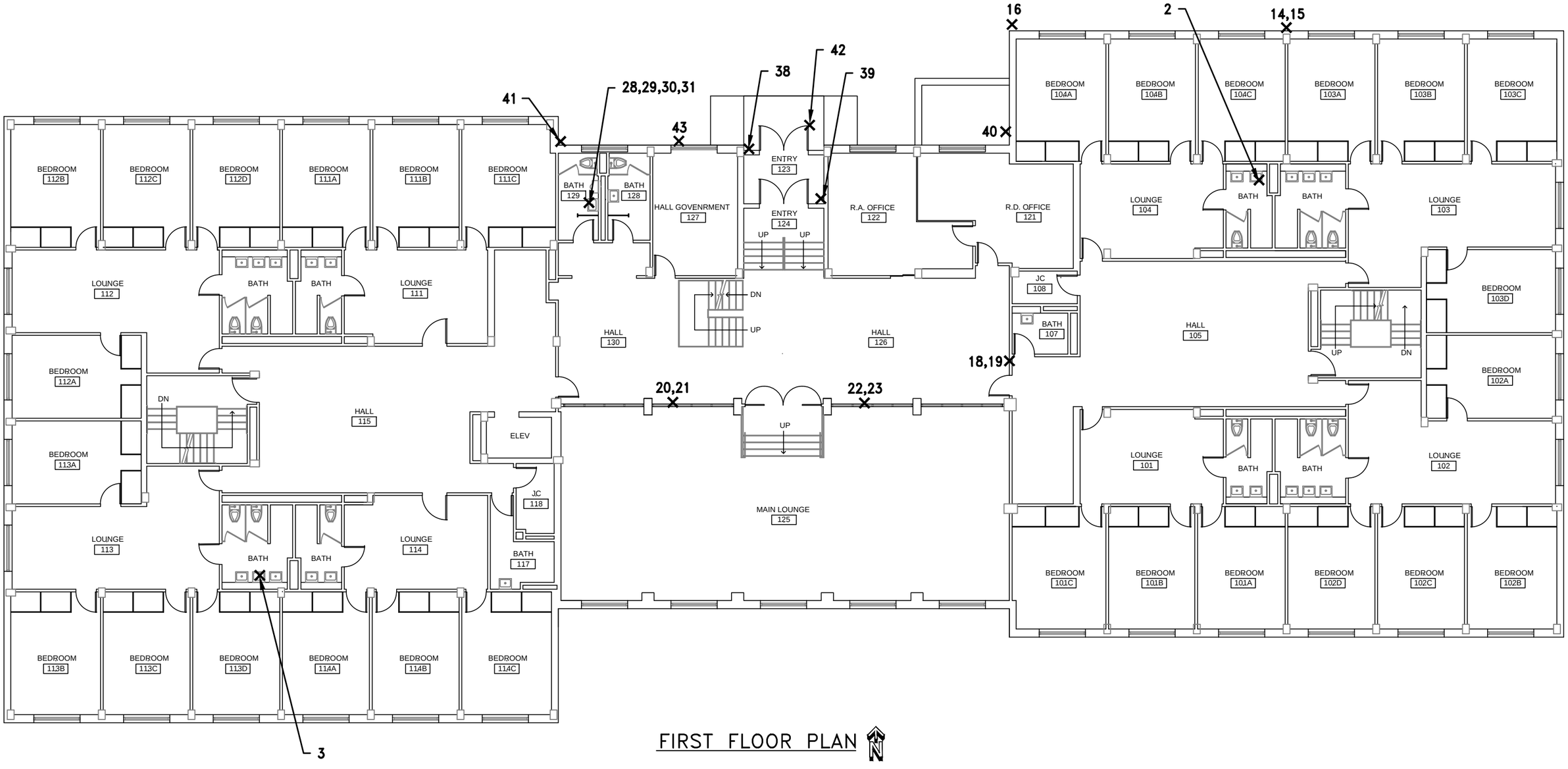
SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171–**
× INDICATES APPROXIMATE SAMPLE LOCATION

ASBESTOS SAMPLE LOCATIONS
BASEMENT

WATTS
ARCHITECTURE
& ENGINEERING
95 Perry Street Suite 300
Buffalo, New York 14203
(716) 206-5100 | (716) 206-5199 Fax

DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018



FIRST FLOOR PLAN

SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171–**

× INDICATES APPROXIMATE SAMPLE LOCATION

ASBESTOS SAMPLE LOCATIONS
FIRST FLOOR

WATTS ARCHITECTURE & ENGINEERING, P.C.
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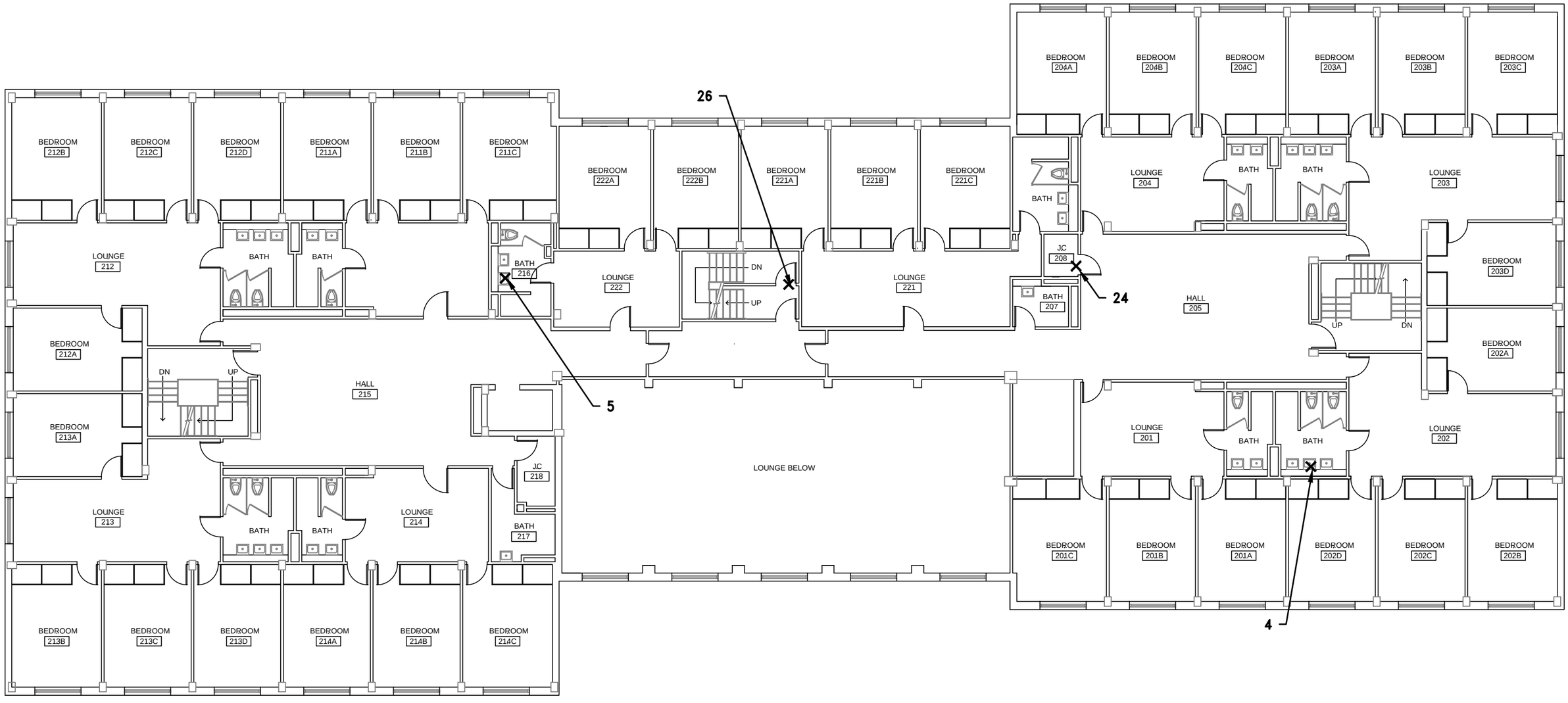
Buffalo, New York 14203
(716) 206-5100 | (716) 206-5199 Fax

DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018



SECOND FLOOR PLAN

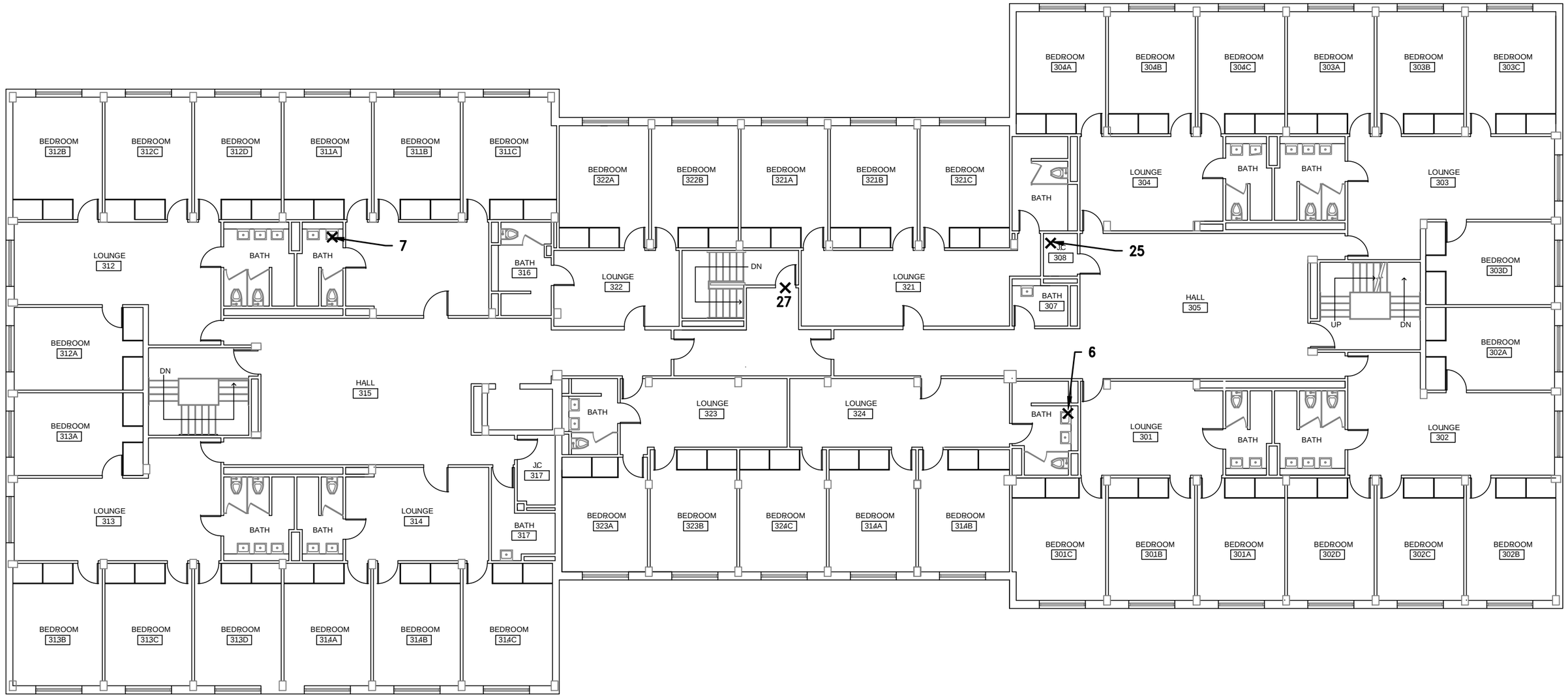
SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171–**
× INDICATES APPROXIMATE SAMPLE LOCATION

ASBESTOS BULK SAMPLE LOCATIONS
SECOND FLOOR

WATTS
ARCHITECTURE &
ENGINEERING, P.C.
95 Perry Street Suite 300
Buffalo, New York 14203
(716) 206-5100 | (716) 206-5199 Fax

DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018



THIRD FLOOR PLAN

SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171–**

✕ INDICATES APPROXIMATE SAMPLE LOCATION

ASBESTOS SAMPLE LOCATIONS
THIRD FLOOR

WATTS ARCHITECTURE & ENGINEERING, P.C.
95 Perry Street Suite 300
Buffalo, New York 14203
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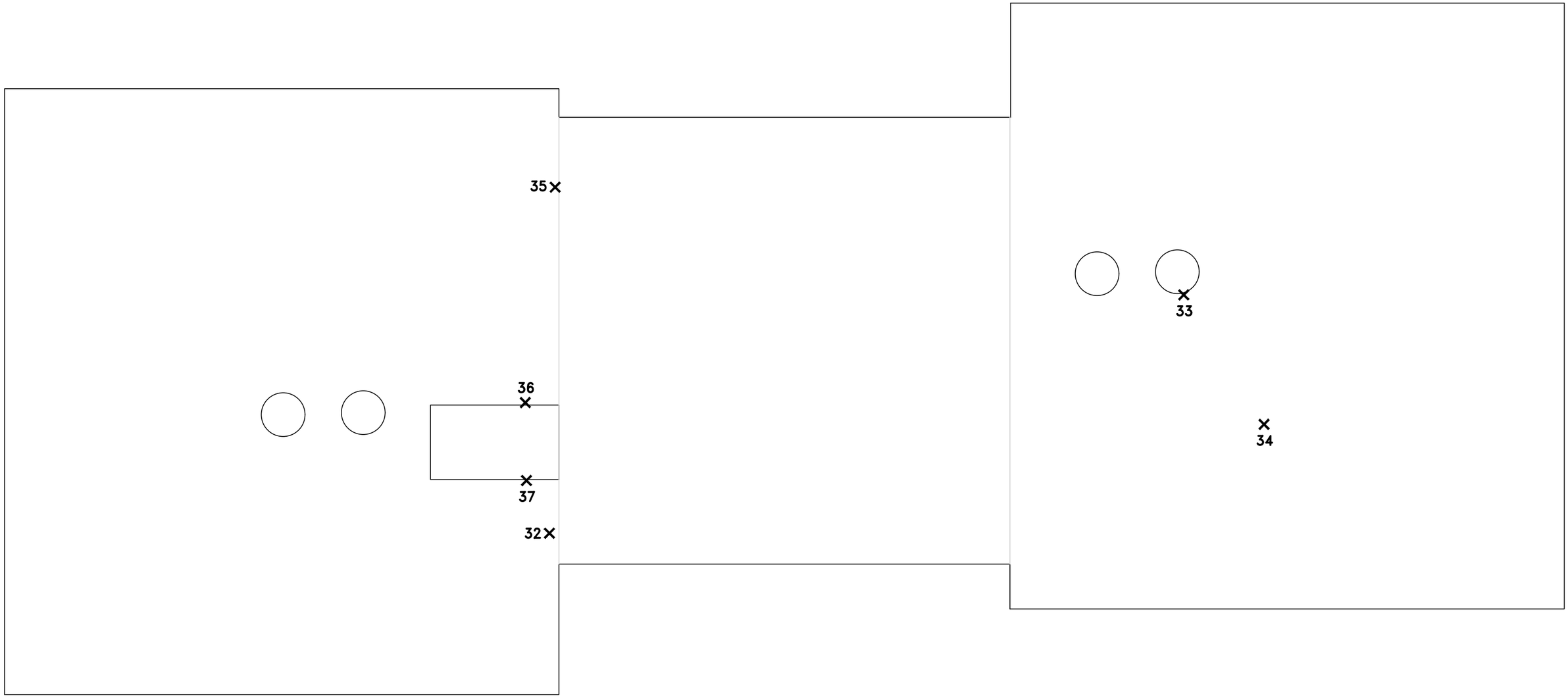
DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018



ROOF PLAN

SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171–**
× INDICATES APPROXIMATE SAMPLE LOCATION

ASBESTOS SAMPLE LOCATIONS
ROOF

WATTS
ARCHITECTURE
& ENGINEERING
95 Perry Street Suite 300
Buffalo, New York 14203
(716) 206-5100 | (716) 206-5199 Fax

DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018

2.2 – ASBESTOS LABORATORY REPORT & CHAIN-OF-CUSTODY FORMS

AmeriSci Richmond
13635 GENITO ROAD
MIDLOTHIAN, VIRGINIA 23112
TEL: (804) 763-1200 • FAX: (804) 763-1800

PLM Bulk Asbestos Report

Watts Architecture & Engineers
Attn: Scott Matthews
95 Perry Street
Suite 300
Buffalo, NY 14203

Date Received 01/22/18 **AmeriSci Job #** 118011847
Date Examined 01/27/18 **P.O. #**
ELAP # 10984 **Page** 1 **of** 12
RE: 17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-1	118011847-01	*Yes*	0.5 %
Location: White Thinset Mortar Behind Bathroom Cer Wall Tile; Oasis Bathroom G-13			(EPA 400 PC) by John S. Shearwood on 01/27/18
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 0.5 %			
Other Material: Non-fibrous 99.5 %			
Comment: Heat Sensitive (organic): 4.2%; Acid Soluble (inorganic): 26.4%; Inert (Non-asbestos): 69.1%			
17171-2	118011847-02	*No*	NAD
Location: White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 104			(by NYS ELAP 198.1) by John S. Shearwood on 01/27/18
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 100 %			
Comment: Heat Sensitive (organic): 6.5%; Acid Soluble (inorganic): 21.0%; Inert (Non-asbestos): 72.4%			
17171-3	118011847-03	*Yes*	0.3 %
Location: White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 113			(EPA 400 PC) by John S. Shearwood on 01/27/18
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 0.3 %			
Other Material: Non-fibrous 99.8 %			
Comment: Heat Sensitive (organic): 5.3%; Acid Soluble (inorganic): 31.0%; Inert (Non-asbestos): 63.4%			
17171-4	118011847-04	*Yes*	0.5 %
Location: White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 202			(EPA 400 PC) by John S. Shearwood on 01/28/18
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 0.5 %			
Other Material: Non-fibrous 99.5 %			
Comment: Heat Sensitive (organic): 4.5%; Acid Soluble (inorganic): 29.0%; Inert (Non-asbestos): 66.2%			

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-5	118011847-05	***Yes***	0.5 % (EPA 400 PC) by John S. Shearwood on 01/28/18

Location: White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 222

Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 0.5 %
Other Material: Non-fibrous 99.5 %
Comment: Heat Sensitive (organic): 4.1%; Acid Soluble (inorganic): 16.6%; Inert (Non-asbestos): 78.9%

17171-6	118011847-06	***Yes***	0.8 % (EPA 400 PC) by John S. Shearwood on 01/28/18

Location: White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 311

Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 0.8 %
Other Material: Non-fibrous 99.3 %
Comment: Heat Sensitive (organic): 5.8%; Acid Soluble (inorganic): 28.5%; Inert (Non-asbestos): 65.2%

17171-7	118011847-07	***Yes***	0.5 % (EPA 400 PC) by John S. Shearwood on 01/28/18

Location: White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 324

Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types: Chrysotile 0.5 %
Other Material: Non-fibrous 99.5 %
Comment: Heat Sensitive (organic): 4.7%; Acid Soluble (inorganic): 27.3%; Inert (Non-asbestos): 67.7%

17171-8	118011847-08	***No***	NAD (by NYS ELAP 198.6) by John S. Shearwood on 01/28/18

Location: White Sink Undercoating; Kitchen G-14

Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 35.3 %
Comment: Heat Sensitive (organic): 29.9%; Acid Soluble (inorganic): 34.8%; Inert (Non-asbestos): 35.3%

17171-9	118011847-09	***No***	NAD (by NYS ELAP 198.6) by John S. Shearwood on 01/28/18

Location: White Sink Undercoating; Kitchen G-13

Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 33 %
Comment: Heat Sensitive (organic): 31.0%; Acid Soluble (inorganic): 36.0%; Inert (Non-asbestos): 33.0%

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-10	118011847-10	*No*	NAD (by NYS ELAP 198.6) by John S. Shearwood on 01/28/18

Location: Beige Carpet Mastic; Suite G-14

Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 23.4 %
Comment: Heat Sensitive (organic): 28.6%; Acid Soluble (inorganic): 48.0%; Inert (Non-asbestos): 23.4%

17171-11	118011847-11	*No*	NAD (by NYS ELAP 198.6) by John S. Shearwood on 01/28/18

Location: Beige Carpet Mastic; Oasis G-13

Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 37.1 %
Comment: Heat Sensitive (organic): 47.0%; Acid Soluble (inorganic): 16.0%; Inert (Non-asbestos): 37.1%

17171-12	118011847-12	*No*	NAD (by NYS ELAP 198.6) by John S. Shearwood on 01/28/18

Location: Beige Window Caulk; Basement Recreation Room - (South Side)

Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 7.1 %
Comment: Heat Sensitive (organic): 73.2%; Acid Soluble (inorganic): 19.7%; Inert (Non-asbestos): 7.1%

17171-13	118011847-13	*No*	NAD (by NYS ELAP 198.6) by John S. Shearwood on 01/28/18

Location: Beige Window Caulk; Basement - Oasis Suite - (West Side)

Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 6.7 %
Comment: Heat Sensitive (organic): 73.4%; Acid Soluble (inorganic): 19.9%; Inert (Non-asbestos): 6.7%

17171-14	118011847-14	*No*	NAD (by NYS ELAP 198.6) by John S. Shearwood on 01/28/18

Location: Coal Tar Pitch Foundation Vapor Barrier; North Side East Half 8" Below Grade

Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 44.4 %
Comment: Heat Sensitive (organic): 48.7%; Acid Soluble (inorganic): 6.9%; Inert (Non-asbestos): 44.4%

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-15	118011847-15	*No*	NAD
Location: Coal Tar Pitch Foundation Vapor Barrier; North Side East Half 8" Below Grade			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 52.9 %			
Comment: Heat Sensitive (organic): 38.7%; Acid Soluble (inorganic): 8.4%; Inert (Non-asbestos): 52.9%			
17171-16	118011847-16	*Yes*	9.3 %
Location: Black Tar On Foundation Wall (Random Applicating); North Side , Above grade			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Gray/Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 9.3 %			
Other Material: Non-fibrous 9.3 %			
Comment: Heat Sensitive (organic): 64.6%; Acid Soluble (inorganic): 16.8%; Inert (Non-asbestos): 9.3%			
17171-17	118011847-17	*No*	NAD
Location: Black Tar On Foundation Wall (Random Applicating); South Side Near Back Entrance			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Gray/Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 23.5 %			
Comment: Heat Sensitive (organic): 70.6%; Acid Soluble (inorganic): 5.9%; Inert (Non-asbestos): 23.5%			
17171-18	118011847-18	*No*	NAD
Location: Brown Interior Window Glazing Compound; Interior Corridor/Lobby Side Window (Wire Mesh)			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 11.1 %			
Comment: Heat Sensitive (organic): 60.7%; Acid Soluble (inorganic): 28.2%; Inert (Non-asbestos): 11.1%			
17171-19	118011847-19	*No*	NAD
Location: Brown Interior Window Glazing Compound; Interior Corridor/Lobby Side Window (Wire Mesh)			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 12.1 %			
Comment: Heat Sensitive (organic): 60.6%; Acid Soluble (inorganic): 27.3%; Inert (Non-asbestos): 12.1%			

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-20	118011847-20	*Yes*	3.1 %
Location: Black Interior Window Glazing Compound; Lobby/Lounge Interior Window			(EPA 400 PC) by John S. Shearwood on 01/28/18
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 3.1 %			
Other Material: Non-fibrous 22 %			
Comment: Heat Sensitive (organic): 41.5%; Acid Soluble (inorganic): 33.4%; Inert (Non-asbestos): 22.0%			
17171-21	118011847-21	*Yes*	2.6 %
Location: Black Interior Window Glazing Compound; Lobby/Lounge Interior Window			(EPA 400 PC) by John S. Shearwood on 01/28/18
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 2.6 %			
Other Material: Non-fibrous 22.3 %			
Comment: Heat Sensitive (organic): 40.2%; Acid Soluble (inorganic): 34.9%; Inert (Non-asbestos): 22.3%			
17171-22	118011847-22	*Yes*	Trace (<0.25 % pc)
Location: Grey Interior Window Glazing Compound; Lobby/Lounge Interior Window (Wire Mesh)			(EPA 400 PC) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile <0.25 % pc			
Other Material: Non-fibrous 5.1 %			
Comment: Heat Sensitive (organic): 18.4%; Acid Soluble (inorganic): 76.3%; Inert (Non-asbestos): 5.1%			
17171-23	118011847-23	*Yes*	Trace (<0.25 % pc)
Location: Grey Interior Window Glazing Compound; Lobby/Lounge Interior Window (Wire Mesh)			(EPA 400 PC) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile <0.25 % pc			
Other Material: Non-fibrous 0.5 %			
Comment: Heat Sensitive (organic): 15.8%; Acid Soluble (inorganic): 83.7%; Inert (Non-asbestos): 0.5%			
17171-24	118011847-24	*No*	NAD
Location: White Control Joint Caulk JC/Bathroom Floors; JC 209			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Gray/White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 16.6 %			
Comment: Heat Sensitive (organic): 38.0%; Acid Soluble (inorganic): 45.4%; Inert (Non-asbestos): 16.6%			

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-25	118011847-25	*No*	NAD
Location: White Control Joint Caulk JC/Bathroom Floors; JC 308			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Gray/White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 17.6 %			
Comment: Heat Sensitive (organic): 43.1%; Acid Soluble (inorganic): 39.3%; Inert (Non-asbestos): 17.6%			
17171-26	118011847-26	*Yes*	8.5 %
Location: White Fire Door Insulation (Wooden Doors); Center Stairwell 2nd Floor Door			(EPA 400 PC) by John S. Shearwood on 01/28/18
Analyst Description: Beige, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types: Chrysotile 8.5 %			
Other Material: Non-fibrous 91.5 %			
17171-27	118011847-27	*Yes*	11 %
Location: White Fire Door Insulation (Wooden Doors); Center Stairwell 3rd Floor Door			(EPA 400 PC) by John S. Shearwood on 01/28/18
Analyst Description: Beige, Heterogeneous, Fibrous, Bulk Material			
Asbestos Types: Chrysotile 11.0 %			
Other Material: Non-fibrous 89 %			
17171-28	118011847-28	*Yes*	28.2 %
Location: Light Fixture Wire Insulation 12" Flush Maint (White Wire); Bathroom 128 (Lobby, Men's Visitors)			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 28.2 %			
Other Material: Non-fibrous 7.1 %			
Comment: Heat Sensitive (organic): 61.4%; Acid Soluble (inorganic): 3.4%; Inert (Non-asbestos): 7.1%			
17171-29	118011847-29	*Yes*	23.5 %
Location: Light Fixture Wire Insulation 12" Flush Maint (Brown Wire); Bathroom 128 (Lobby, Men's Visitors)			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 23.5 %			
Other Material: Non-fibrous 11.8 %			
Comment: Heat Sensitive (organic): 61.4%; Acid Soluble (inorganic): 3.4%; Inert (Non-asbestos): 11.8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-30	118011847-30	*No*	NAD
Location: Black Cardboard Gasket For 12" Square Flush Maint Light; Bathroom 128 (Lobby, Men's Visitors)			(by NYS ELAP 198.1) by John S. Shearwood on 01/28/18
Analyst Description: Black/Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 15 %, Non-fibrous 85 %			
17171-31	118011847-31	*No*	NAD
Location: Black Cardboard Gasket For 12" Square Flush Maint Light; Bathroom 128 (Lobby, Men's Visitors)			(by NYS ELAP 198.1) by John S. Shearwood on 01/28/18
Analyst Description: Black/Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Cellulose 15 %, Non-fibrous 85 %			
17171-32	118011847-32	*Yes*	Trace (<0.25 % pc)
Location: Black Roof Tar (Misc Patches/Spots); Parapet Wall (Copper Parapet) Next To Hatch			(EPA 400 PC) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile <0.25 % pc			
Other Material: Non-fibrous 2.6 %			
Comment: Heat Sensitive (organic): 64.6%; Acid Soluble (inorganic): 32.6%; Inert (Non-asbestos): 2.6%			
17171-33	118011847-33	*No*	NAD
Location: Black Roof Tar (Misc Patches/Spots); Side Of Round Skylight Framing			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 0.1 %			
Comment: Heat Sensitive (organic): 96.7%; Acid Soluble (inorganic): 3.2%; Inert (Non-asbestos): 0.1%			
17171-34	118011847-34	*No*	NAD
Location: Coal Tar & Felt Pad Vapor Barrier (Roof); Roof - East/2 Near Square vent			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: White/Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 1.1 %, Non-fibrous 3 %			
Comment: Heat Sensitive (organic): 94.8%; Acid Soluble (inorganic): 1.2%; Inert (Non-asbestos): 4.1%			

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-35	118011847-35	*No*	NAD
Location: Coal Tar & Felt Pad Vapor Barrier (Roof); Roof - West/2 North Of Hatch & Elevator Shaft			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: White/Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass Trace, Non-fibrous 0.3 %			
Comment: Heat Sensitive (organic): 95.9%; Acid Soluble (inorganic): 3.8%; Inert (Non-asbestos): 0.3%			
17171-36	118011847-36	*No*	NAD
Location: Reddish/Tan Counterflashing Caulk; North Side Of Elevator Shaft Doghouse			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Red, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 4.3 %			
Comment: Heat Sensitive (organic): 72.4%; Acid Soluble (inorganic): 23.3%; Inert (Non-asbestos): 4.3%			
17171-37	118011847-37	*No*	NAD
Location: Reddish/Tan Counterflashing Caulk; South Side Of Elevator Shaft Doghouse			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Red, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 10 %			
Comment: Heat Sensitive (organic): 61.8%; Acid Soluble (inorganic): 28.2%; Inert (Non-asbestos): 10.0%			
17171-38	118011847-38	*No*	NAD
Location: White Door Caulk; Front Entrance Vestibule Outer Door			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 5.3 %			
Comment: Heat Sensitive (organic): 68.7%; Acid Soluble (inorganic): 26.0%; Inert (Non-asbestos): 5.3%			
17171-39	118011847-39	*No*	NAD
Location: White Door Caulk; Front Entrance Vestibule Inner Door			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 4.3 %			
Comment: Heat Sensitive (organic): 69.0%; Acid Soluble (inorganic): 26.7%; Inert (Non-asbestos): 4.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-40	118011847-40	*No*	NAD
Location: Grey Masonry Control Joint Caulk; East Of Front Entrance At Slate/Brick Joint			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown/Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 7.3 %			
Comment: Heat Sensitive (organic): 51.2%; Acid Soluble (inorganic): 41.5%; Inert (Non-asbestos): 7.3%			
17171-41	118011847-41	*No*	NAD
Location: Grey Masonry Control Joint Caulk; West Of Front Entrance At Slate/Brick Joint			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown/Gray, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 9 %			
Comment: Heat Sensitive (organic): 46.2%; Acid Soluble (inorganic): 44.8%; Inert (Non-asbestos): 9.0%			
17171-42	118011847-42	*No*	NAD
Location: Brittle Black Caulk Between Slate Entrance Panels; Soffit Above Front Door			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 15.4 %			
Comment: Heat Sensitive (organic): 46.1%; Acid Soluble (inorganic): 38.5%; Inert (Non-asbestos): 15.4%			
17171-43	118011847-43	*No*	NAD
Location: Brittle Black Caulk Between Slate Entrance Panels; Slate Panels West Of Front Entrance			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Black, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass Trace, Non-fibrous 11.7 %			
Comment: Heat Sensitive (organic): 48.5%; Acid Soluble (inorganic): 39.8%; Inert (Non-asbestos): 11.7%			
17171-44	118011847-44	*Yes*	31.6 %
Location: Brown Duct Insulation Pin Mastic; Mech Equip Room			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 31.6 %			
Other Material: Non-fibrous 7.9 %			
Comment: Heat Sensitive (organic): 49.8%; Acid Soluble (inorganic): 10.7%; Inert (Non-asbestos): 7.9%			

See Reporting notes on last page

PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-45	118011847-45	***Yes***	25.6 %
Location: Brown Duct Insulation Pin Mastic; Mech Equip Room			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types: Chrysotile 25.6 %			
Other Material: Non-fibrous 12.8 %			
Comment: Heat Sensitive (organic): 50.8%; Acid Soluble (inorganic): 10.7%; Inert (Non-asbestos): 12.8%			
17171-46	118011847-46	***No***	NAD
Location: Brown Door Caulk (Stairwells & Exterior); Rear Center Door (Exterior)			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Gray/Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 8.9 %			
Comment: Heat Sensitive (organic): 61.7%; Acid Soluble (inorganic): 29.5%; Inert (Non-asbestos): 8.9%			
17171-47	118011847-47	***No***	NAD
Location: Brown Door Caulk (Stairwells & Exterior); East Ground Floor Stairwell Door			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Gray/Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 9.1 %			
Comment: Heat Sensitive (organic): 53.4%; Acid Soluble (inorganic): 37.5%; Inert (Non-asbestos): 9.1%			
17171-48	118011847-48	***No***	NAD
Location: Brown Masonry Control Joint Caulk; Rear Brick/Brick Joint West Of Entrance			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 9.9 %			
Comment: Heat Sensitive (organic): 52.9%; Acid Soluble (inorganic): 37.3%; Inert (Non-asbestos): 9.9%			
17171-49	118011847-49	***No***	NAD
Location: Brown Masonry Control Joint Caulk; Brick/Brick Joint Above Rear Entrance			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 8.5 %			
Comment: Heat Sensitive (organic): 55.0%; Acid Soluble (inorganic): 36.5%; Inert (Non-asbestos): 8.5%			

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PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
17171-50	118011847-50	*No*	NAD
Location: 1x1 Cellulose Ceiling Tiles; Ground Floor Corridor Outside Elec Room			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Fibrous glass 2.2 %, Non-fibrous 29 %			
Comment: Heat Sensitive (organic): 17.0%; Acid Soluble (inorganic): 51.8%; Inert (Non-asbestos): 31.2%			
17171-51	118011847-51	*No*	NAD
Location: 1x1 Cellulose Ceiling Tiles; Ground Floor Corridor At Rear Door			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: White, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 18.6 %			
Comment: Heat Sensitive (organic): 12.8%; Acid Soluble (inorganic): 68.6%; Inert (Non-asbestos): 18.6%			
17171-52	118011847-52	*No*	NAD
Location: Brown Homosote Board; Ceiling Of Elec Room			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 0.5 %			
Comment: Heat Sensitive (organic): 99.5%; Inert (Non-asbestos): 0.5%			
17171-53	118011847-53	*No*	NAD
Location: Brown Homosote Board; Ceiling Of Elec Room			(by NYS ELAP 198.6) by John S. Shearwood on 01/28/18
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Bulk Material			
Asbestos Types:			
Other Material: Non-fibrous 0.2 %			
Comment: Heat Sensitive (organic): 99.8%; Inert (Non-asbestos): 0.2%			

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PLM Bulk Asbestos Report

17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

Reporting Notes:

Analyzed by: John S. Shearwood Date: 1/27/2018 Reviewed by:

*NAD = no asbestos detected, Detection Limit <1%, Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; "Present" or NVA = "No Visible Asbestos" are observations made during a qualitative analysis; NA = not analyzed; NA/PS = not analyzed / positive stop; PLM Bulk Asbestos Analysis by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) and ELAP PLM Analysis Protocol 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NYSDOH ELAP Lab # 10984); CA ELAP Lab # 2508; Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). This PLM report relates ONLY to the items tested.

Table I
Summary of Bulk Asbestos Analysis Results
17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	17171-1		0.310	4.2	26.4	69.3	Chrysotile 0.5	Chrysotile Trace
Location:	White Thinset Mortar Behind Bathroom Cer Wall Tile; Oasis Bathroom G-13							
02	17171-2		0.242	6.5	21.0	72.3	NAD	Chrysotile Trace
Location:	White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 104							
03	17171-3		0.170	5.3	31.0	63.5	Chrysotile 0.3	Chrysotile Trace
Location:	White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 113							
04	17171-4		0.130	4.5	29.0	66.4	Chrysotile 0.5	Chrysotile Trace
Location:	White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 202							
05	17171-5		0.421	4.1	16.6	79.2	Chrysotile 0.5	Chrysotile Trace
Location:	White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 222							
06	17171-6		0.375	5.8	28.5	65.6	Chrysotile 0.8	Chrysotile Trace
Location:	White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 311							
07	17171-7		0.264	4.7	27.3	67.9	Chrysotile 0.5	Chrysotile Trace
Location:	White Thinset Mortar Behind Bathroom Cer Wall Tile; Suite 324							
08	17171-8		0.085	29.9	34.8	35.3	NAD	NAD
Location:	White Sink Undercoating; Kitchen G-14							
09	17171-9		0.102	31.0	36.0	33.0	NAD	NAD
Location:	White Sink Undercoating; Kitchen G-13							
10	17171-10		0.126	28.6	48.0	23.4	NAD	NAD
Location:	Beige Carpet Mastic; Suite G-14							
11	17171-11		0.172	47.0	16.0	37.1	NAD	NAD
Location:	Beige Carpet Mastic; Oasis G-13							
12	17171-12		0.202	73.2	19.7	7.1	NAD	NAD
Location:	Beige Window Caulk; Basement Recreation Room - (South Side)							
13	17171-13		0.171	73.4	19.9	6.7	NAD	NAD
Location:	Beige Window Caulk; Basement - Oasis Suite - (West Side)							
14	17171-14		0.295	48.7	6.9	44.4	NAD	NAD
Location:	Coal Tar Pitch Foundation Vapor Barrier; North Side East Half 8" Below Grade							
15	17171-15		0.364	38.7	8.4	52.9	NAD	NAD
Location:	Coal Tar Pitch Foundation Vapor Barrier; North Side East Half 8" Below Grade							
16	17171-16		0.252	64.6	16.8	9.3	Chrysotile 9.3	NA
Location:	Black Tar On Foundation Wall (Random Applicating); North Side , Above grade							

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	17171-17		0.233	70.6	5.9	23.5	NAD	NAD
Location:	Black Tar On Foundation Wall (Random Applicating); South Side Near Back Entrance							
18	17171-18		0.209	60.7	28.2	11.1	NAD	NAD
Location:	Brown Interior Window Glazing Compound; Interior Corridor/Lobby Side Window (Wire Mesh)							
19	17171-19		0.237	60.6	27.3	12.1	NAD	NAD
Location:	Brown Interior Window Glazing Compound; Interior Corridor/Lobby Side Window (Wire Mesh)							
20	17171-20		0.166	41.5	33.4	22.0	Chrysotile 3.1	NA
Location:	Black Interior Window Glazing Compound; Lobby/Lounge Interior Window							
21	17171-21		0.152	40.2	34.9	22.3	Chrysotile 2.6	NA
Location:	Black Interior Window Glazing Compound; Lobby/Lounge Interior Window							
22	17171-22		0.355	18.4	76.3	5.1	Chrysotile <0.25	Chrysotile Trace
Location:	Grey Interior Window Glazing Compound; Lobby/Lounge Interior Window (Wire Mesh)							
23	17171-23		0.215	15.8	83.7	0.4	Chrysotile <0.25	Chrysotile Trace
Location:	Grey Interior Window Glazing Compound; Lobby/Lounge Interior Window (Wire Mesh)							
24	17171-24		0.195	38.0	45.4	16.5	NAD	Chrysotile Trace
Location:	White Control Joint Caulk JC/Bathroom Floors; JC 209							
25	17171-25		0.177	43.1	39.3	17.5	NAD	Anthophyllite Trace
Location:	White Control Joint Caulk JC/Bathroom Floors; JC 308							
26	17171-26		----	----	----	----	Chrysotile 8.5	NA
Location:	White Fire Door Insulation (Wooden Doors); Center Stairwell 2nd Floor Door							
27	17171-27		----	----	----	----	Chrysotile 11.0	NA
Location:	White Fire Door Insulation (Wooden Doors); Center Stairwell 3rd Floor Door							
28	17171-28		0.107	61.4	3.4	7.1	Chrysotile 28.2	NA
Location:	Light Fixture Wire Insulation 12" Flush Maint (White Wire); Bathroom 128 (Lobby, Men's Visitors)							
29	17171-29		0.107	61.4	3.4	11.8	Chrysotile 23.5	NA
Location:	Light Fixture Wire Insulation 12" Flush Maint (Brown Wire); Bathroom 128 (Lobby, Men's Visitors)							
30	17171-30		----	----	----	----	NAD	NA
Location:	Black Cardboard Gasket For 12" Square Flush Maint Light; Bathroom 128 (Lobby, Men's Visitors)							
31	17171-31		----	----	----	----	NAD	NA
Location:	Black Cardboard Gasket For 12" Square Flush Maint Light; Bathroom 128 (Lobby, Men's Visitors)							
32	17171-32		0.248	64.6	32.6	2.7	Chrysotile <0.25	Chrysotile Trace
Location:	Black Roof Tar (Misc Patches/Spots); Parapet Wall (Copper Parapet) Next To Hatch							

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	17171-33		0.133	96.7	3.2	0.1	NAD	NAD
Location:	Black Roof Tar (Misc Patches/Spots); Side Of Round Skylight Framing							
34	17171-34		0.076	94.8	1.2	4.1	NAD	NAD
Location:	Coal Tar & Felt Pad Vapor Barrier (Roof); Roof - East/2 Near Square vent							
35	17171-35		0.152	95.9	3.8	0.3	NAD	NAD
Location:	Coal Tar & Felt Pad Vapor Barrier (Roof); Roof - West/2 North Of Hatch & Elevator Shaft							
36	17171-36		0.362	72.4	23.3	4.3	NAD	NAD
Location:	Reddish/Tan Counterflashing Caulk; North Side Of Elevator Shaft Doghouse							
37	17171-37		0.379	61.8	28.2	10.0	NAD	NAD
Location:	Reddish/Tan Counterflashing Caulk; South Side Of Elevator Shaft Doghouse							
38	17171-38		0.473	68.7	26.0	5.3	NAD	NAD
Location:	White Door Caulk; Front Entrance Vestibule Outer Door							
39	17171-39		0.169	69.0	26.7	4.3	NAD	NAD
Location:	White Door Caulk; Front Entrance Vestibule Inner Door							
40	17171-40		0.261	51.2	41.5	7.3	NAD	NAD
Location:	Grey Masonry Control Joint Caulk; East Of Front Entrance At Slate/Brick Joint							
41	17171-41		0.314	46.2	44.8	9.0	NAD	NAD
Location:	Grey Masonry Control Joint Caulk; West Of Front Entrance At Slate/Brick Joint							
42	17171-42		0.316	46.1	38.5	15.4	NAD	NAD
Location:	Brittle Black Caulk Between Slate Entrance Panels; Soffit Above Front Door							
43	17171-43		0.295	48.5	39.8	11.6	NAD	Anthophyllite Trace
Location:	Brittle Black Caulk Between Slate Entrance Panels; Slate Panels West Of Front Entrance							
44	17171-44		0.197	49.8	10.7	7.9	Chrysotile 31.6	NA
Location:	Brown Duct Insulation Pin Mastic; Mech Equip Room							
45	17171-45		0.089	50.8	10.7	12.8	Chrysotile 25.6	NA
Location:	Brown Duct Insulation Pin Mastic; Mech Equip Room							
46	17171-46		0.352	61.7	29.5	8.9	NAD	NAD
Location:	Brown Door Caulk (Stairwells & Exterior); Rear Center Door (Exterior)							
47	17171-47		0.291	53.4	37.5	9.1	NAD	NAD
Location:	Brown Door Caulk (Stairwells & Exterior); East Ground Floor Stairwell Door							
48	17171-48		0.258	52.9	37.3	9.9	NAD	NAD
Location:	Brown Masonry Control Joint Caulk; Rear Brick/Brick Joint West Of Entrance							

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Table I
Summary of Bulk Asbestos Analysis Results
17171; Deyo Hall; SUNY New Paltz (Report Amended 3/8/2018)

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
49	17171-49		0.211	55.0	36.5	8.5	NAD	NAD
Location:	Brown Masonry Control Joint Caulk; Brick/Brick Joint Above Rear Entrance							
50	17171-50		0.125	17.0	51.8	31.2	NAD	NAD
Location:	1x1 Cellulose Ceiling Tiles; Ground Floor Corridor Outside Elec Room							
51	17171-51		0.244	12.8	68.6	18.6	NAD	NAD
Location:	1x1 Cellulose Ceiling Tiles; Ground Floor Corridor At Rear Door							
52	17171-52		0.108	99.5	0.0	0.5	NAD	NAD
Location:	Brown Homosote Board; Ceiling Of Elec Room							
53	17171-53		0.122	99.8	0.0	0.2	NAD	NAD
Location:	Brown Homosote Board; Ceiling Of Elec Room							

TEM Analyzed By: Jean L. Mayes _____ Date Analyzed: 3/4/2018 Reviewed By: _____ Date Reviewed: 3/4/2018

Semi-Quantitative Analysis: NAD = no asbestos detected; NA = not analyzed; NA/PS = not analyzed due to positive stop; Trace = <1%;
PLM analysis by EPA 600/R-93/116 per 40 CFR 763 (NVLAP Lab Code 101904-0) or NY ELAP 198.1 for New York friable samples which includes quantitation of any vermiculite observed (198.6 for NOB samples) or EPA 400 pt ct by EPA 600/M4-82-020 (NY ELAP Lab # 10984);
TEM prep by EPA 600/R-93/116 Section 2.3 (analysis by Section 2.5, not covered by NVLAP Bulk accreditation); or NY ELAP 198.4 for New York NOB samples (NY ELAP Lab # 10984);

** Warning Notes: Consider PLM fiber diameter limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris, soils or other heterogeneous materials for which a combination PLM/TEM evaluation is recommended; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only.

118011847

WATTS ARCHITECTURE & ENGINEERING
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Page: 1 of 5
Date: 1-16-18

Client: Architecture+
Project: Deyo Hall
Building / Location: SUNY New Paltz
Contact: Scott Matthews at (315) 491-2307
Email Results to: smatthews@watts-ae.com
Mail Invoice to: Accounts Payable
Watts Architecture & Engineering
95 Perry Street, Buffalo, NY 14203

Watts Project No.: 17171

Turnaround Requested: ___ 3 Hr. ___ 48 Hr.
Analysis Requested: ___ 6 Hr. ___ 72 Hr.
PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

17171- 1	White thinset mortar behind bathroom cer. wall tile		Oasis Bathroom G-13		
2	"	"	"	Suite 104	
3	"	"	"	Suite 113	
4	"	"	"	Suite 202	
5	"	"	"	Suite 222	
6	"	"	"	Suite 311	
7	"	"	"	Suite 324	
8	White Sink undercoating			Kitchen G-14	
9	"	"	"	Kitchen G-13	
10	Beige Carpet Mastic			Suite G-14	
11	"	"	"	Oasis G-13	
12	Beige window Caulk	~~(PCB-1)~~		Basement Recreation Room - South side	
13	"	"	(PCB-1)	Basement Oasis Suite - West side	

Sampled By: Scott Matthews Date: 1-16-18 Received By: ___ Date: ___
Relinquished By: [signature] Date: 1-19-18 Received By: ___ Date: ___
Comments: Do not reference PCB sample number on asbestos data report

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By [signature]

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WATTS ARCHITECTURE & ENGINEERING
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

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17171-14	Coal tar pitch foundation vapor barrier	North side east half 8" below grade		
15	" " "	North side east half 8" below grade		
16	Black tar on foundation wall (random application)	~~Black tar~~ North side, above grade		
17	" " "	South side near back entrance		
18	Brown interior window glazing compound (PCB-2)	Interior corridor/Lobby side window (WIRE MESH)		
19	" " "	Interior corridor/lobby side window (WIRE MESH)		
20	Black interior window glazing compound (PCB-3)	Lobby/Lounge interior window		
21	" " "	Lobby/Lounge interior window		
22	Gray interior window glazing compound (PCB-4)	Lobby/Lounge interior window (WIRE MESH)		
23	" " "	Lobby/Lounge interior window (WIRE MESH)		
24	White control joint caulk JC/Bathroom tiles (~~PCB-5~~)	JC 209		
25	" " " (PCB-5)	JC 308		

Sampled By: [signature] Date: 1-16-18 Received By: ___ Date: ___
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Building / Location: SUNY New Paltz

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Email Results to: smatthews@watts-ae.com

____ 24 Hr. ____ 6-10 Day

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17171-26	White fire door insulation (wooden doors)	Center stairwell 2nd floor door		
27	" " "	Center stairwell 3rd floor door		
28	Light fixture wire insulation 12" Flush Mount (White wire)	Bathroom 128 (Lobby, Men's visitors)		
29	" " " (Brown wire)	Bathroom 128 (Lobby, Men's visitors)		
30	Black cardboard gasket for 12" Flush Mount light	Bathroom 128 (Lobby, Men's visitors)		
31	" " "	Bathroom 128 (Lobby, Men's visitors)		
32	Black roof tar (misc patches/spots)	Parapet wall (copper parapet) next to hatch		
33	" " "	Side of round skylight framing		
34	Coal tar & felt pad vapor barrier (roof)	Roof - East/2 near square vent		
35	" " "	Roof - West/2 North of hatch & elevator shaft		
36	Reddish/tan counterflashing caulk (PCB-6)	North Side of elevator shaft doghouse		
37	" " "	South side of elevator shaft doghouse		

Sampled By: [signature] Date: 1-16-18 Received By: ____ Date: ____

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WATTS ARCHITECTURE & ENGINEERING
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

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17171-38	White door caulk ~~(PCB-7)~~	Front entrance vestibule outer door		
39	" " "(PCB-7)	Front entrance vestibule inner door		
40	Grey masonry control joint caulk (PCB-8)	~~North~~ East of front entrance at slate/brick joint		
41	" " "	~~South~~ West of front entrance at slate/brick joint		
42	Bottle black caulk between slate entrance panels (PCB-9)	Soffit above front door		
43	" " "	Slate panels west of front entrance		
44	Brown Duct insulation pin mastic	Mech Equip Room		
45	" " "	Mech Equip Room		
46	Brown door caulk (stairwells & exterior) (PCB-10)	Rear center door (exterior)		
47	" " "	East ground floor stairwell door		
48	Brown masonry control joint caulk (PCB-11)	Rear brick/brick joint west of entrance		
49	" " "	Brick/Brick joint above rear entrance		
~~50~~	~~Cellulose Ceiling Tile~~			
~~51~~	~~" " "~~			

Sampled By: [signature] Date: 1-16-18 Received By: ________ Date: ________
Relinquished By: [signature] Date: 1-19-18 Received By: ________ Date: ________
Comments: Do not reference PCB sample numbers on asbestos data report

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By [initials]

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ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

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___ 24 Hr. ___ 6-10 Day

17171-50	1x1 cellulose ceiling tile	Ground floor corridor outside elec. room		
51	" " "	Ground floor corridor at rear door		
52	Brown Homosote board	Ceiling of Elec. Room		
53	" " "	Ceiling of Elec. Room		

Sampled By: Scott Matthews Date: 1-17-18 Received By: ___ Date: ___
Relinquished By: [signature] Date: 1-19-18 Received By: ___ Date: ___
Comments:

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JAN 22 2018
By [signature]

2.3 – PHOTOGRAPHS

Front of Deyo Hall.

Asbestos-containing acoustical ceiling texture (ACT) in residential suites and stairwells throughout the building.
Note typical light fixture with asbestos-containing wire insulation.

WATTS ARCHITECTURE & ENGINEERING
120 East Washington Street. Suite 414
Syracuse, NY 13202
Ph:315.214.5526

Prepared By: CRW

PRE-RENOVATION SURVEY FOR ASBESTOS CONTAINING MATERIALS AND POLYCHLORINATED BIPHENYLS

DEYO HALL RENOVATION – STATE UNIVERSITY OF NEW YORK AT NEW PALTZ SUCF PROJECT NO. 341830

PROJECT PHOTOGRAPHS

Project #17171 March 2018

Thinset mortar for ceramic wall tile in bathrooms does not contain asbestos great than 1% and is considered a non-ACM.

Hot water tank with asbestos-containing insulation in basement mechanical equipment room.

WATTS ARCHITECTURE & ENGINEERING
120 East Washington Street. Suite 414
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Ph:315.214.5526

Prepared By: CRW

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DEYO HALL RENOVATION – STATE UNIVERSITY OF NEW YORK AT NEW PALTZ SUCF PROJECT NO. 341830

PROJECT PHOTOGRAPHS

Project #17171 March 2018

Asbestos-containing brown pin mastic for duct insulation in basement mechanical equipment room.

Piping with asbestos-containing mud pipe fitting insulation in basement laundry room (typical).

WATTS ARCHITECTURE & ENGINEERING
120 East Washington Street. Suite 414
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Ph:315.214.5526

Prepared By: CRW

PRE-RENOVATION SURVEY FOR ASBESTOS CONTAINING MATERIALS AND POLYCHLORINATED BIPHENYLS

DEYO HALL RENOVATION – STATE UNIVERSITY OF NEW YORK AT NEW PALTZ SUCF PROJECT NO. 341830

PROJECT PHOTOGRAPHS

Project #17171 March 2018

Interior windows between lounge lobby with PCB and asbestos-containing window glazing compound.

Typical stairwell fire door with asbestos-containing insulation.

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Syracuse, NY 13202
Ph:315.214.5526

Prepared By: CRW

PRE-RENOVATION SURVEY FOR ASBESTOS CONTAINING MATERIALS AND POLYCHLORINATED BIPHENYLS

DEYO HALL RENOVATION – STATE UNIVERSITY OF NEW YORK AT NEW PALTZ SUCF PROJECT NO. 341830

PROJECT PHOTOGRAPHS

Project #17171 March 2018

Control joint in lobby flooring with PCB-containing caulk.

Clerestory and storefront windows in main floor lounge with asbestos and PCB-containing window glazing compound.

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120 East Washington Street. Suite 414
Syracuse, NY 13202
Ph:315.214.5526

Prepared By: CRW

PRE-RENOVATION SURVEY FOR ASBESTOS CONTAINING MATERIALS AND POLYCHLORINATED BIPHENYLS

DEYO HALL RENOVATION – STATE UNIVERSITY OF NEW YORK AT NEW PALTZ SUCF PROJECT NO. 341830

PROJECT PHOTOGRAPHS

Project #17171 March 2018

2.4 – PRIOR ASBESTOS SURVEY REPORT DATA

2.0 ASBESTOS-CONTAINING MATERIALS

This section includes information on all suspect ACM identified and sampled by Watts. This section contains the following: Homogeneous Materials List containing the homogeneous materials identified, their corresponding sample numbers and whether or not they are ACM, as well as drawings identifying the approximate locations of asbestos bulk samples.

HOMOGENEOUS MATERIALS LIST

DEYO HALL
STATE UNIVERSITY OF NEW YORK AT NEW PALTZ

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
AHU Gasket Seal	Mechanical Room AHU	M	Y6181-1	NAD	NAD	N
	Mechanical Room AHU		Y6181-2	NAD	NAD	
	Mechanical Room AHU		Y6181-3	NAD	NA	
Mud Fitting	Mech Room Valve over AHU	T	Y6181-4	1.6% Chrysotile	NA	Y
	Mech Room HW Supply		Y6181-5	NA/PS	NA	
	Mech Room Side of AHU		Y6181-6	NA/PS	NA	
Lagging Seal on Fiberglass TSI	Mechanical Room TSI	M	Y6181-7	NAD	NAD	N
	Mechanical Room TSI		Y6181-8a	NAD	NAD	
	Mechanical Room TSI		Y6181-8b	NAD	NA	
Tank Insulation	Mechanical Room Tank	T	Y6181-9	6.6% Chrysotile	NA	Y
	Mechanical Room Tank		Y6181-10	NA/PS	NA	
	Mechanical Room Tank		Y6181-11	NA/PS	NA	
Press Board Ceiling Panel	Mechanical Room	M	Y6181-12	ND	NA	N
	Mechanical Room		Y6181-13a	ND	NA	
	Mechanical Room		Y6181-13b	ND	NA	
Cloth Vibration Dampener	Mechanical Room AHU	M	Y6181-14	ND	NA	N
	Mechanical Room AHU		Y6181-15	ND	NA	
	Mechanical Room AHU		Y6181-16	ND	NA	
AHU Interior Fiberglass Insulation Mastic	Mechanical Room AHU	M	Y6181-17	NAD	NAD	N
	Mechanical Room AHU		Y6181-18	NAD	NA	
	Mechanical Room AHU		Y6181-19	NAD	NAD	
12"x12" White Floor Tile (Newer Stock)	Basement Linen Room	M	Y6181-20	NAD	NAD	N
	Basement W Vestibule		Y6181-21	NAD	NAD	
	Third Floor Stairwell		Y6181-22	NAD	NA	
Mastic for 12"x12" White Floor Tile (Newer Stock)	Basement Linen Room	M	Y6181-23	NAD	NAD	N
	Basement Western Vestibule		Y6181-24	NAD	NAD	
	Third Floor Stairwell		Y6181-25	NAD	NA	
1'x1' Ceiling Tile	Basement Corridor	M	Y6181-26	ND	NA	N
	Hall 115		Y6181-27	ND	NA	
	Hall 315		Y6181-28	ND	NA	
4" Brown Cove Base	Laundry Room SEC	M	Y6181-29	NAD	NAD	N
	Room 127 SEC		Y6181-30	Non-ACM	NAD	
	Corridor Outside 024		Y6181-31	NAD	NA	

HOMOGENEOUS MATERIALS LIST

DEYO HALL
STATE UNIVERSITY OF NEW YORK AT NEW PALTZ

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
Mastic for 4" Brown Covebase	Laundry Room SEC	M	Y6181-32	NAD	NAD	N
	Room 127 SEC		Y6181-33	NAD	NAD	
	Corridor Outside 024		Y6181-34	NAD	NA	
6" Brown Covebase	Rec Room East Door	M	Y6181-35	NAD	NAD	N
	Hall 115 at Bathroom Corner		Y6181-36	NAD	NAD	
	Hall 315 at Bathroom Corner		Y6181-37	NAD	NA	
Mastic for 6" Brown Covebase	Rec Room East Door	M	Y6181-38	NAD	NAD	N
	Hall 115 at Bathroom Corner		Y6181-39	NAD	NAD	
	Hall 315 at Bathroom Corner		Y6181-40	NAD	NA	
Carpet Mastic	Hall 15 Center	M	Y6181-41	NAD	NAD	N
	Hall 115 Outside Room 114		Y6181-42	NAD	NAD	
	Hall 315 Center		Y6181-43	NAD	NA	
Sheetrock Wallboard	Rec Room Pipe Chase	M	Y6181-44	ND	NA	N
	Hall 15 at Elec Panel		Y6181-45	ND	NA	
	Kitchen Room 14		Y6181-46	ND	NA	
Slate-like Stair Compound	Center Stairwell 2nd Level	M	Y6181-47	ND	NA	N
	Center Stairwell 1st Level		Y6181-48	ND	NA	
	Center Stairwell Ground Level		Y6181-49	ND	NA	
Drywall Joint Compound	Hall 15 at Elec Panel	M	Y6181-50	ND	NA	N
	Hall 315 at Water Fountain		Y6181-51	0.75 Chrysotile	NA	
	Corridor 300 at Ceiling		Y6181-52	ND	NA	
Spray-on Acoustical Ceiling Texture	**Bathroom 3**	S	**Y6181-53**	**ND**	**NA**	Y
	Western Vestibule		**Y6181-54**	**9.8% Chrysotile**	**NA**	
	Room 114		**Y6181-55**	**NA/PS**	**NA**	
	2nd Floor Stairwell		**Y6181-56**	**NA/PS**	**NA**	
	Room 211		**Y6181-57**	**NA/PS**	**NA**	
	Room 311		**Y6181-58**	**NA/PS**	**NA**	
	Room 324		**Y6181-59**	**NA/PS**	**NA**	
12"x12" White Floor Tile (older stock)	Bedroom 114b	M	Y6181-60	NAD	NAD	N
	Room 322		Y6181-61	NAD	NAD	
	Room 324		Y6181-62	NAD	NA	
Mastic for 12x12 White Floor Tile (old stock)	Bedroom 114b	M	Y6181-63	1.2% Chrysotile	NA	Y
	Room 322		**Y6181-64**	**NA/PS**	**NA**	
	Room 324		**Y6181-65**	**NA/PS**	**NA**	
Brown Stair Tread	Stairwell Western Vestibule	M	Y6181-66	NAD	NAD	N
	Stairwell Eastern Vestibule		Y6181-67	NAD	NA	
	Center Stairwell 2nd Floor		Y6181-68	NAD	NAD	
Mastic For Brown Stair Tread	Stairwell Western Vestibule	M	Y6181-69	NAD	NAD	N
	Stairwell Eastern Vestibule		Y6181-70	Non-ACM	NA	
	Center Stairwell 2nd Floor		Y6181-71	NAD	NAD	

HOMOGENEOUS MATERIALS LIST

DEYO HALL

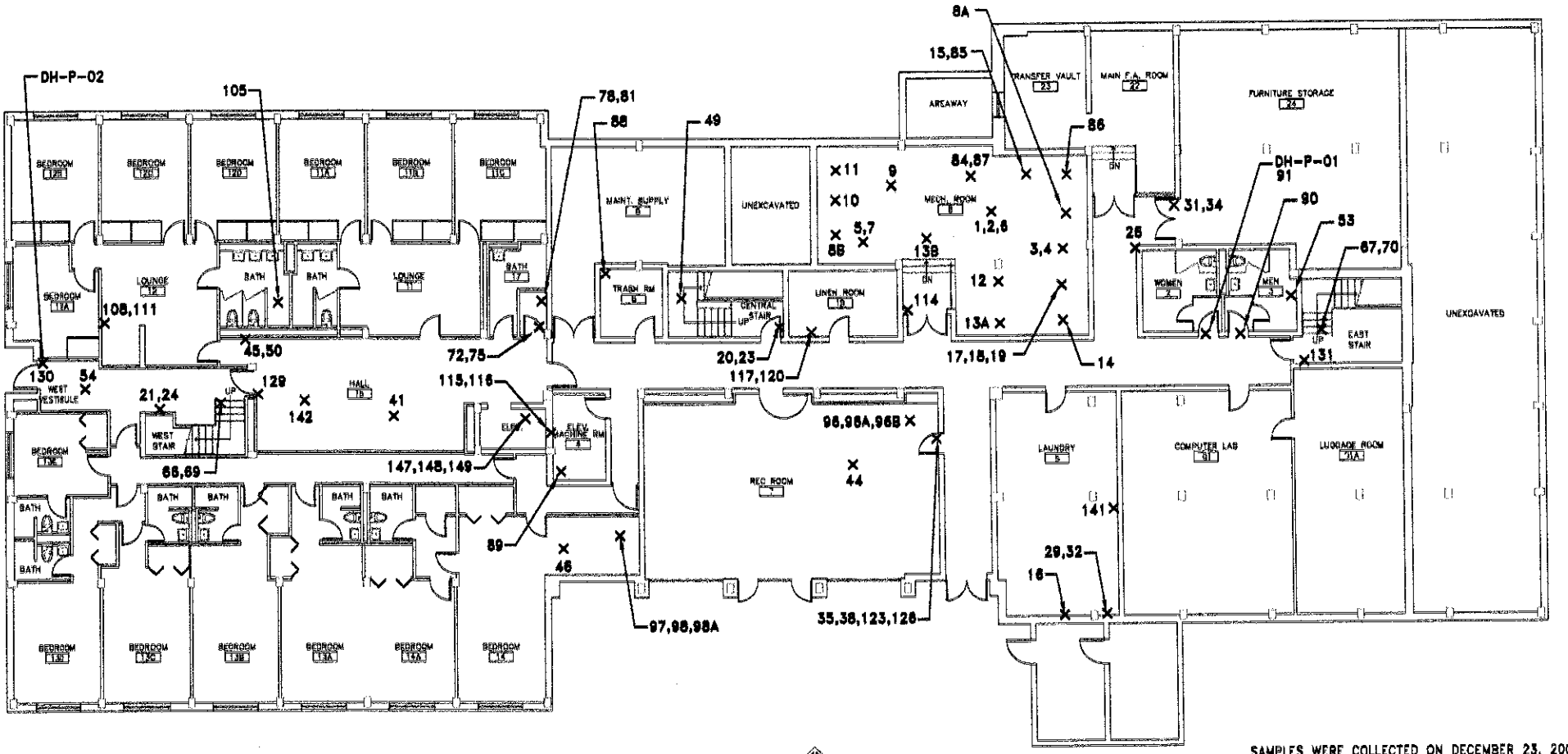
STATE UNIVERSITY OF NEW YORK AT NEW PALTZ

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
4"x4" Ceramic Tile Grout	Janitorial Closet 17	M	Y6181-72	0.25% Chrysotile	NA	N
	Janitorial Closet 117		Y6181-73	<1% Chrysotile	NA	
	Bathroom 128		Y6181-74	<1% Chrysotile	NA	
4"x4" Ceramic Tile Mud Set	Janitorial Closet 17	M	Y6181-75	<1% Chrysotile	NA	N
	Janitorial Closet 117		Y6181-76	<1% Chrysotile	NA	
	Bathroom 128		Y6181-77	<1% Chrysotile	NA	
1"x2" Ceramic Tile Grout	Janitorial Closet 17	M	Y6181-78	ND	NA	N
	Janitorial Closet 217		Y6181-79	ND	NA	
	Janitorial Closet 308		Y6181-80	ND	NA	
1"x2" Ceramic Tile Mortar	Janitorial Closet 17	M	Y6181-81	0.25% Chrysotile	NA	N
	Janitorial Closet 217		Y6181-82	ND	NA	
	Janitorial Closet 308		Y6181-83	ND	NA	
Canvas Duct Wrap	Mechanical Room	M	Y6181-84	ND	NA	N
	Mechanical Room		Y6181-85	ND	NA	
	Mechanical Room		Y6181-86	ND	NA	
Canvas Pipe Wrap	Mechanical Room	M	Y6181-87	ND	NA	N
	Trash Room 9		Y6181-88	ND	NA	
	Elevator Room 4		Y6181-89	ND	NA	
Door Caulk (White)	Men's Bathroom 3	M	Y6181-90	NAD	NAD	N
	Women's Bathroom 2		Y6181-91	NAD	NAD	
	Janitorial Closet 117		Y6181-92	NAD	NA	
Vinyl Wall Paper	Hall Government 127	M	Y6181-93	NAD	NAD	N
	1st Floor Central Stairwell		Y6181-94	NAD	NA	
	Vinyl Wall Paper		Y6181-95	NAD	NAD	
Sink Undercoat (Black)	Rec Room	M	Y6181-96	NAD	NAD	N
	Rec Room		Y6181-96a	ND	ND	
	Rec Room		Y6181-96b	ND	ND	
Sink Undercoat (White)	Apt 14 Kitchen	M	Y6181-97	NAD	NAD	N
	Apt 14 Kitchen		Y6181-98	NAD	NA	
	Apt 14 Kitchen		Y6181-98a	ND	NAD	
Skim Coat Plaster on Concrete Column	Hall 115	S	Y6181-99	ND	NA	N
	Hall 215		Y6181-100	ND	NA	
	Hall 315		Y6181-101	ND	NA	
Quarry Tile Mortar	Lounge 125 Entrance	M	Y6181-102	ND	NA	N
	Lounge 125 Entrance		Y6181-103	ND	NA	
	Lounge 125 Entrance		Y6181-104	ND	NA	
Terrazzo Shower Base	Bathroom 12	M	Y6181-105	ND	NA	N
	Bathroom 114		Y6181-106	ND	NA	
	Bathroom 214		Y6181-107	ND	NA	
4" Black Cove Base	Room 12	M	Y6181-108	NAD	NAD	N
	Room 114		Y6181-109	NAD	NAD	
	Room 214		Y6181-110	NAD	NA	

HOMOGENEOUS MATERIALS LIST

DEYO HALL
STATE UNIVERSITY OF NEW YORK AT NEW PALTZ

Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)		ACM
				PLM	TEM	Y/N
Mastic for 4" Black Cove Base	Room 12	M	Y6181-111	NAD	NAD	N
	Room 114		Y6181-112	NAD	NAD	
	Room 214		Y6181-113	NAD	NA	
Fire Caulk (red)	Mechanical Room	M	Y6181-114	NAD	NAD	N
	Elevator Room		Y6181-115	NAD	NAD	
	Elevator Room		Y6181-116	NAD	NA	
9"x9" Floor Tile	Linen Room	M	Y6181-117	5.4% Chrysotile	NA	Y
	Room 114B		Y6181-118	NA/PS	NA	
	Room 112		Y6181-119	NA/PS	NA	
Mastic for 9"x9" Floor Tile	Linen Room	M	Y6181-120	3.4% Chrysotile	NA	Y
	Room 114B		Y6181-121	NA/PS	NA	
	Room 112		Y6181-122	NA/PS	NA	
16"x16" Floor Tile	Rec Room	M	Y6181-123	NAD	NAD	N
	Hall 115 Corner at Bathroom		Y6181-124	NAD	NAD	
	Hall 215 Corner at Bathroom		Y6181-125	NAD	NA	
Mastic for 16"x16" Floor Tile	Rec Room	M	Y6181-126	Non-ACM	NA	N
	Hall 115 Corner at Bathroom		Y6181-127	NAD	NAD	
	Hall 215 Corner at Bathroom		Y6181-128	NAD	NAD	
Interior Door Caulk (Brown)	West Vestibule to Hall	M	Y6181-129	NAD	NAD	N
	West Vestibule to Entrance		Y6181-130	NAD	NAD	
	East Vestibule to Corridor		Y6181-131	NAD	NA	
Slop Sink Caulk	Janitorial Closet 114	M	Y6181-132	Non-ACM	NA	N
	Janitorial Closet 217		Y6181-133	NAD	NAD	
	Janitorial Closet 317		Y6181-134	NAD	NAD	
Mastic for 1'x1' Ceiling Tile	Hall 315 Next to Skylight	M	Y6181-135	NAD	NAD	N
	Corridor 300 Next to Skylight		Y6181-136	NAD	NAD	
	Corridor 300 Next to Skylight		Y6181-137	NAD	NA	
Interior Expansion Joint Caulk	Entrance to Lounge 126	M	Y6181-138	NAD	NAD	N
	Entrance to Lounge 126		Y6181-139	NAD	NAD	
	Entrance to Lounge 126		Y6181-140	NAD	NA	
Residual Mastic from 9"x9" FT Removed in 2006	Laundry Room 5 - East Side	M	Y6181-141	ND	NA	Y
	Beneath Carpet W Corridor		Y6181-142	ND	NA	
	2nd Fl Central Stairwell		Y6181-143	2.3% Chrysotile	NA	
Exterior Skim Coat Concrete	Main Entrance Soffit W Side	S	Y6181-144	ND	NA	N
	Main Entrance Soffit E Side		Y6181-145	ND	NA	
	Main Entrance Soffit E Side		Y6181-146	ND	NA	
Mastic Beneath Blue Rubber Tile in Elevator	Elevator	M	Y6181-147	ND	ND	N
	Elevator		Y6181-148	ND	ND	
	Elevator		Y6181-149	ND	NA	



ALL SAMPLE NUMBERS ARE PREFIXED BY Y6181-.

BASEMENT PLAN

SAMPLES WERE COLLECTED ON DECEMBER 23, 2008 AND JANUARY 14, 2009.
× INDICATES APPROXIMATE SAMPLE LOCATION.

ASBESTOS/PCB SAMPLE LOCATIONS
BASEMENT

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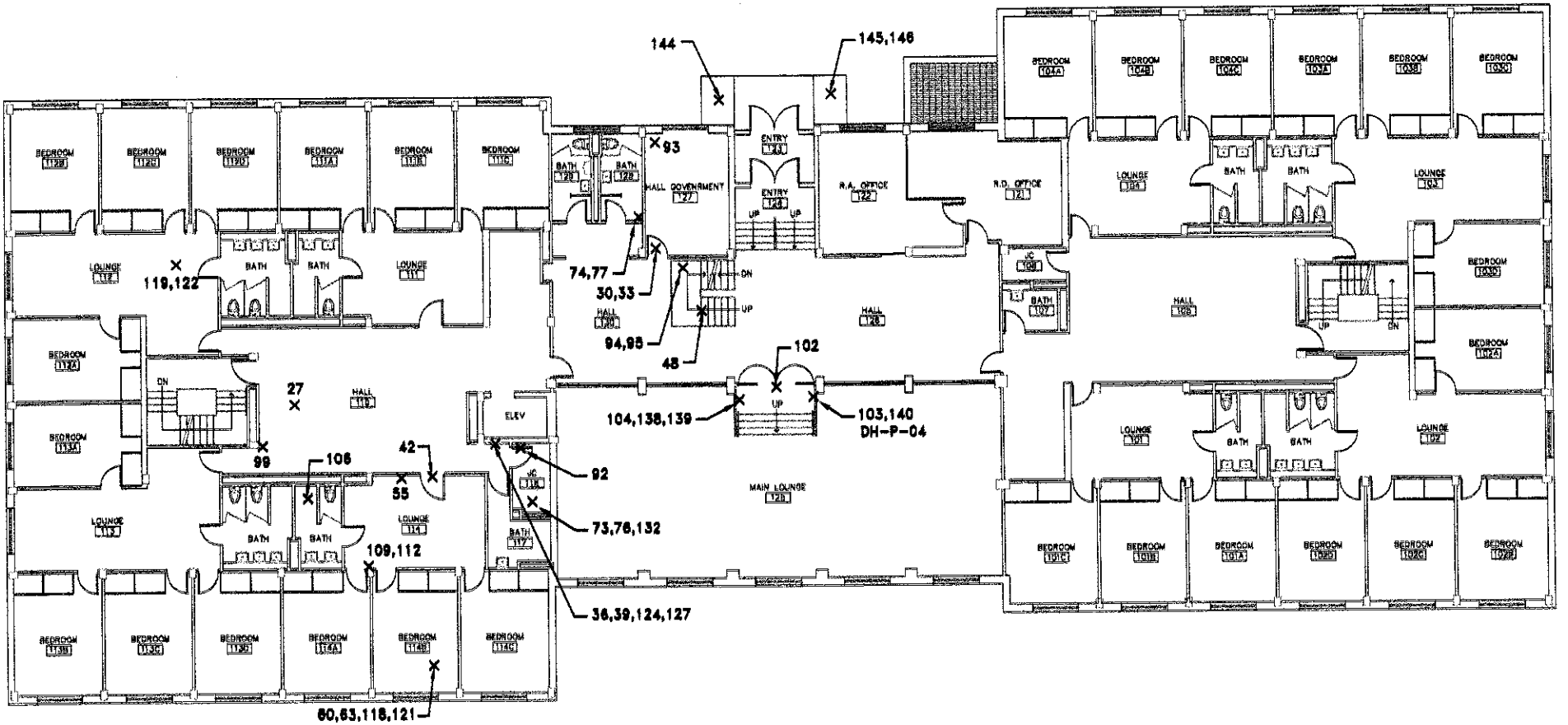
DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | JANUARY 2009



ALL SAMPLE NUMBERS ARE PREFIXED BY Y6181-.

FIRST FLOOR PLAN

SAMPLES WERE COLLECTED ON DECEMBER 23, 2008 AND JANUARY 14, 2009.
X INDICATES APPROXIMATE SAMPLE LOCATION.

ASBESTOS/PCB SAMPLE LOCATIONS FIRST FLOOR

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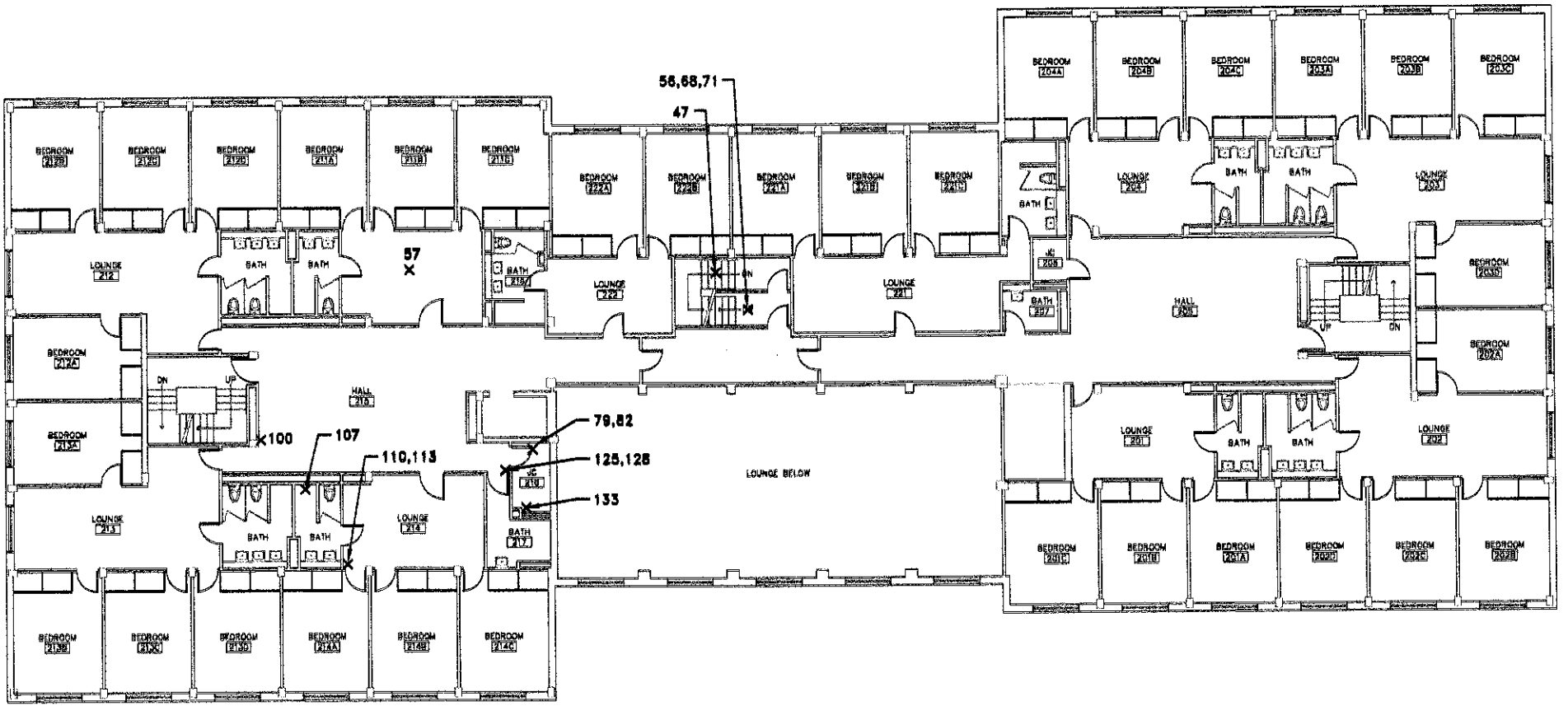

SECOND FLOOR PLAN

ALL SAMPLE NUMBERS ARE PREFIXED BY Y6181-.

SAMPLES WERE COLLECTED ON DECEMBER 23, 2008 AND JANUARY 14, 2009.

X INDICATES APPROXIMATE SAMPLE LOCATION.

ASBESTOS BULK SAMPLE LOCATIONS
SECOND FLOOR

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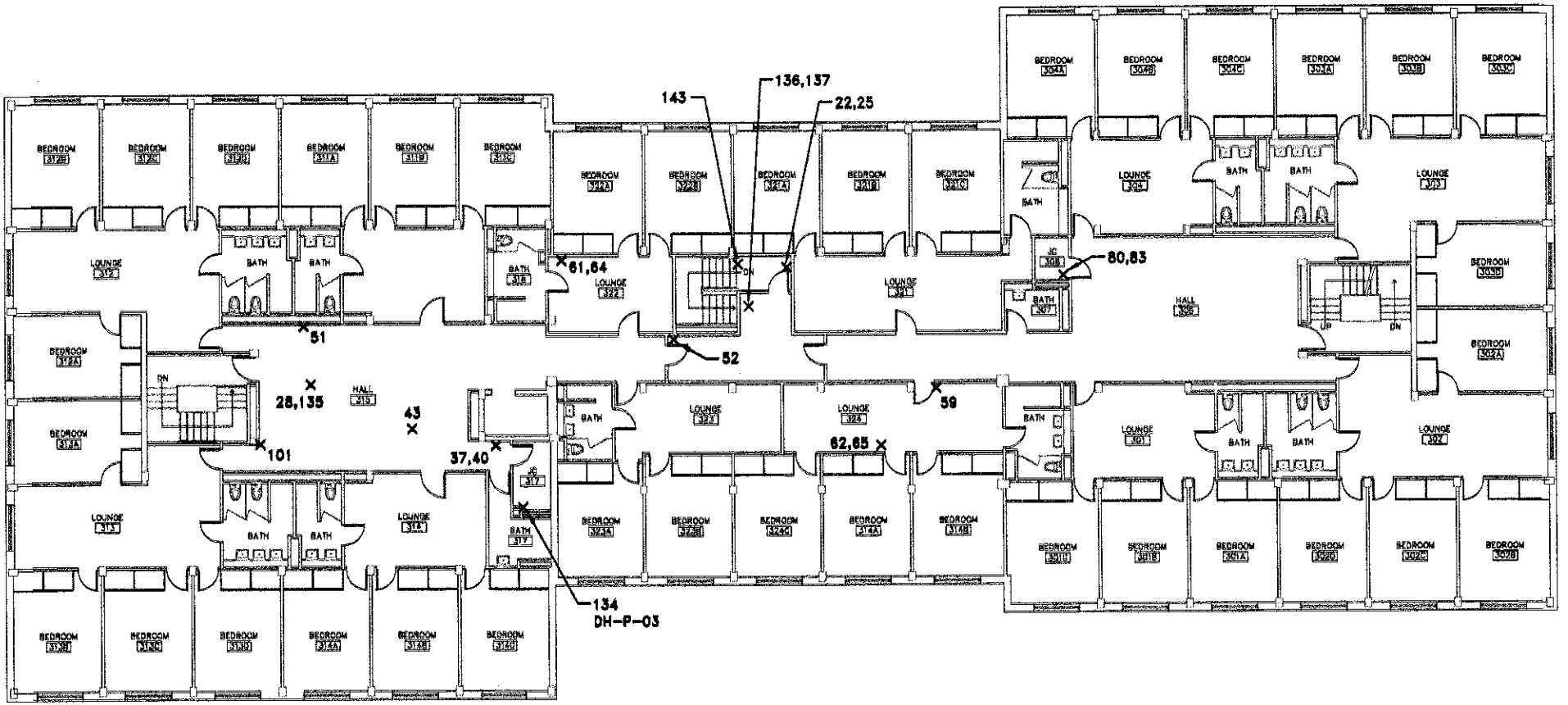

THIRD FLOOR PLAN

ALL SAMPLE NUMBERS ARE PREFIXED BY Y6181-.

SAMPLES WERE COLLECTED ON DECEMBER 23, 2008 AND JANUARY 14, 2009.
X INDICATES APPROXIMATE SAMPLE LOCATION.

ASBESTOS/PCB SAMPLE LOCATIONS
THIRD FLOOR

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Project: **Y6181.04 / SUNY New Paltz, Deyo Hall Program Study, Deyo Hall**

Customer ID: WATT50
Customer PO:
Received: 12/30/08 9:37 AM
EMSL Order: 140806728

EMSL Proj:
Analysis Date: 1/6/2009
Report Date: 1/9/2009

Asbestos Analysis of Bulk Materials by PLM via the NY State ELAP 198.1 Method

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
Y6181-4 *140806728-0001*	mech rm valve over AHU	Tan Fibrous Homogeneous	30.00% Glass	68.40% Non-fibrous (other)	1.60% Chrysotile
Y6181-5 *140806728-0002*	mech rm HW supply over pumps				Positive Stop
Y6181-6 *140806728-0003*	mech rm back side of AHUs				Positive Stop
Y6181-9 *140806728-0004*	mech rm tank	Gray Fibrous Homogeneous	30.00% Glass	63.40% Non-fibrous (other)	6.60% Chrysotile
Y6181-10 *140806728-0005*	mech rm tank				Positive Stop
Y6181-11 *140806728-0006*	mech rm tank				Positive Stop
Y6181-12 *140806728-0007*	mech rm tank	Brown Fibrous Homogeneous	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
Y6181-13a *140806728-0008*	mech rm tank	Brown Fibrous Homogeneous	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
Y6181-13b *140806728-0009*	mech rm tank	Brown Fibrous Homogeneous	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
Y6181-14 *140806728-0010*	mech rm AHU	Various Fibrous Heterogeneous	10.00% Cellulose 80.00% Glass	10.00% Non-fibrous (other)	None Detected
Y6181-15 *140806728-0011*	mech rm AHU	White Fibrous Homogeneous	85.00% Glass	15.00% Non-fibrous (other)	None Detected

Analyst(s)

Andrew Maciejewski (48)
Tom Hanes (4)

Rhonda McGee

Rhonda McGee, Laboratory Manager
or other approved signatory

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Analysis performed by EMSL Buffalo (NVLAP #200056-0), NY ELAP #11608

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Asbestos Analysis of Bulk Materials by PLM via the NY State ELAP 198.1 Method

Sample	Location	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
Y6181-16 *140806728-0012*	laundry rm	Mauve Fibrous Heterogeneous	90.00% Cellulose	10.00% Non-fibrous (other)	None Detected
Y6181-26 *140806728-0013*	basement corridor	Tan Fibrous Homogeneous	40.00% Cellulose 40.00% Glass	20.00% Non-fibrous (other)	None Detected
Y6181-27 *140806728-0014*	hall 115	Tan Fibrous Homogeneous	40.00% Cellulose 40.00% Glass	20.00% Non-fibrous (other)	None Detected
Y6181-28 *140806728-0015*	hall 315	Tan Fibrous Homogeneous	40.00% Cellulose 40.00% Glass	20.00% Non-fibrous (other)	None Detected
Y6181-44 *140806728-0016*	rec rm pipe chase	White Fibrous Layer # 1	25.00% Cellulose 5.00% Glass	70.00% Non-fibrous (other)	None Detected
Y6181-44 *140806728-0016A*	paper	White Fibrous Layer # 1	25.00% Cellulose 5.00% Glass	70.00% Non-fibrous (other)	None Detected
Y6181-45 *140806728-0017*	hall 15 at elec panel	Brown Fibrous Layer # 2	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
Y6181-45 *140806728-0017A*	paper	White Fibrous Layer # 1	20.00% Cellulose 10.00% Glass	70.00% Non-fibrous (other)	None Detected
Y6181-46 *140806728-0018*	kitchen rm 14	Brown Fibrous Layer # 2	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
Y6181-46 *140806728-0018A*	paper	White Fibrous Layer # 1	20.00% Cellulose 10.00% Glass	70.00% Non-fibrous (other)	None Detected
Y6181-47 *140806728-0019*	center stairwell 2nd level	Brown Fibrous Layer # 2	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected

Analyst(s)
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Tom Hanes (4)

Rhonda McGee
Rhonda McGee, Laboratory Manager
or other approved signatory

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Asbestos Analysis of Bulk Materials by PLM via the NY State ELAP 198.1 Method

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
Y6181-48 *140806728-0020*	center stairwell 1st level	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-49 *140806728-0021*	center stairwell basement level	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-50 *140806728-0022*	hall 15 at elec panel	Gray Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-51 *140806728-0023*	hall 315 at water fountain	Tan Fibrous Homogeneous		99.25% Non-fibrous (other)	0.75% Chrysotile
Y6181-52 *140806728-0024*	corridor 300 at ceiling	White Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-53 *140806728-0025*	bathroom 3	White Fibrous Homogeneous	5.00% Cellulose	95.00% Non-fibrous (other)	None Detected
Y6181-54 *140806728-0026*	western vestibule	White Fibrous Homogeneous		90.20% Non-fibrous (other)	9.80% Chrysotile
Y6181-55 *140806728-0027*	rm 114				Positive Stop
Y6181-56 *140806728-0028*	2nd fl stairwell				Positive Stop
Y6181-57 *140806728-0029*	rm 211				Positive Stop
Y6181-58 *140806728-0030*	rm 311				Positive Stop

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Tom Hanes (4)

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Analysis performed by EMSL Buffalo (NVLAP #200056-0), NY ELAP #11606

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Asbestos Analysis of Bulk Materials by PLM via the NY State ELAP 198.1 Method

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
Y6181-59 *140806728-0031*	rm 324				**Positive Stop**
Y6181-72 *140806728-0032*	JC 17	Gray Fibrous Homogeneous		99.75% Non-fibrous (other)	0.25% Chrysotile
Y6181-73 *140806728-0033*	JC 117	Gray Fibrous Homogeneous		100.00% Non-fibrous (other)	<1% Chrysotile
Y6181-74 *140806728-0034*	bath 128	Gray Fibrous Homogeneous		100.00% Non-fibrous (other)	<1% Chrysotile
Y6181-75 *140806728-0035*	JC 17	White Fibrous Homogeneous		100.00% Non-fibrous (other)	<1% Chrysotile
Y6181-76 *140806728-0036*	JC 117	White Fibrous Homogeneous		100.00% Non-fibrous (other)	<1% Chrysotile
Y6181-77 *140806728-0037*	bath 128	White Fibrous Homogeneous		100.00% Non-fibrous (other)	<1% Chrysotile
Y6181-78 *140806728-0038*	JC 17	Brown Fibrous Homogeneous	1.00% Cellulose	99.00% Non-fibrous (other)	None Detected
Y6181-79 *140806728-0039*	JC 217	Brown Fibrous Homogeneous	1.00% Cellulose	99.00% Non-fibrous (other)	None Detected
Y6181-80 *140806728-0040*	JC 308	Brown Fibrous Homogeneous	1.00% Cellulose	99.00% Non-fibrous (other)	None Detected
Y6181-81 *140806728-0041*	JC 17	Brown Fibrous Homogeneous		99.75% Non-fibrous (other)	0.25% Chrysotile

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Rhonda McGee, Laboratory Manager
or other approved signatory

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Asbestos Analysis of Bulk Materials by PLM via the NY State ELAP 198.1 Method

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
Y6181-82 *140806728-0042*	JC 217	Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-83 *140806728-0043*	JC 308	Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-84 *140806728-0044*	mechanical rm	Brown Fibrous Homogeneous	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
Y6181-85 *140806728-0045*	mechanical rm	Brown Fibrous Homogeneous	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
Y6181-86 *140806728-0046*	mechanical rm	White Fibrous Homogeneous	60.00% Cellulose	40.00% Non-fibrous (other)	None Detected
Y6181-87 *140806728-0047*	mechanical rm	White Fibrous Homogeneous	80.00% Cellulose	20.00% Non-fibrous (other)	None Detected
Y6181-88 *140806728-0048*	trashroom 9	Gray Fibrous Homogeneous	90.00% Cellulose	10.00% Non-fibrous (other)	None Detected
Y6181-89 *140806728-0049*	elevator rm 4	Gray Fibrous Homogeneous	95.00% Cellulose	5.00% Non-fibrous (other)	None Detected
Y6181-99 *140806728-0050*	hall 115	White Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-100 *140806728-0051*	hall 215	White Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-101 *140806728-0052*	hall 315	White Fibrous Homogeneous	5.00% Cellulose	95.00% Non-fibrous (other)	None Detected

Analyst(s)
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Tom Hanes (4)

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Rhonda McGee, Laboratory Manager
or other approved signatory

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Asbestos Analysis of Bulk Materials by PLM via the NY State ELAP 198.1 Method

			Non-Asbestos		Asbestos
Sample	**Location**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
Y6181-102 *140806728-0053*	lounge 125 entrance	Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-103 *140806728-0054*	lounge 125 entrance	Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-104 *140806728-0055*	lounge 125 entrance	Brown Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-105 *140806728-0056*	bathroom 12	White Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-106 *140806728-0057*	bathroom 114	White Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected
Y6181-107 *140806728-0058*	bathroom 214	White Non-Fibrous Homogeneous		100.00% Non-fibrous (other)	None Detected

Analyst(s)
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Tom Hanes (4)

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PLMPointCount-1

THIS IS THE LAST PAGE OF THE REPORT.

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Customer ID: WATT50
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EMSL Proj:
Analysis Date: 1/2/2009
Report Date: 1/9/2009

Asbestos Analysis of Non-Friable Organically Bound Materials by PLM via the NY State ELAP 198.6 Method

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-1 *140806728-0059*	AHU gasket seal	Black/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-2 *140806728-0060*	AHU gasket seal	Black/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-3 *140806728-0061*	AHU gasket seal	Black/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-7 *140806728-0062*	lagging seal on fiberglass TSI	Tan/Cream	100.0	None	Inconclusive: No Asbestos Detected
Y6181-8a *140806728-0063*	lagging seal on fiberglass TSI	Tan/Cream	100.0	None	Inconclusive: No Asbestos Detected
Y6181-8b *140806728-0064*	lagging seal on fiberglass TSI	Tan/Cream	100.0	None	Inconclusive: No Asbestos Detected
Y6181-17 *140806728-0065*	AHU interior fiberglass insulation mastic	Rust/Yellow	100.0	None	Inconclusive: No Asbestos Detected
Unable to separate from insulation.					
Y6181-18 *140806728-0066*	AHU interior fiberglass insulation mastic	Rust/Yellow	100.0	None	Inconclusive: No Asbestos Detected
Unable to separate from insulation.					

Analyst(s)

Tom Hanes (74)

Rhonda McGee

Rhonda McGee, Laboratory Manager
or other approved signatory

*Polarized Light Microscopy (PLM) is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative Transmission Electron Microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing. The test results contained within this report meet the requirements of NELAC unless otherwise noted.EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. The above test report relates only to the items tested. EMSL bears no responsibility for sample collectionactivities or analytical method limitations. Unless otherwise noted, the results in this report have not been blank corrected.Samples received in good condition unless otherwise noted.

ACCREDITATIONS: NVLAP #200056-0 and NY STATE ELAP #11606

NYS198-2

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Asbestos Analysis of Non-Friable Organically Bound Materials by PLM via the NY State ELAP 198.6 Method

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-19 *140806728-0067*	AHU interior fiberglass insulation mastic	Rust/Yellow	100.0	None	Inconclusive: No Asbestos Detected
Unable to separate from insulation.					
Y6181-20 *140806728-0068*	12x12 white fl tile, newer stock	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-21 *140806728-0069*	12x12 white fl tile, newer stock	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-22 *140806728-0070*	12x12 white fl tile, newer stock	White/Red/Blue	100.0	None	Inconclusive: No Asbestos Detected
Y6181-23 *140806728-0071*	mastic for 12x12 white floor tile, newer stock	Yellow/Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-24 *140806728-0072*	mastic for 12x12 white floor tile, newer stock	Yellow/Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-25 *140806728-0073*	mastic for 12x12 white floor tile, newer stock	Yellow/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-29 *140806728-0074*	4" brown covebase	Tan	100.0	None	Inconclusive: No Asbestos Detected

Analyst(s)
Tom Hanes (74)

Rhonda McGee

Rhonda McGee, Laboratory Manager
or other approved signatory

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ACCREDITATIONS: NVLAP #200056-0 and NY STATE ELAP #11606

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Asbestos Analysis of Non-Friable Organically Bound Materials by PLM via the NY State ELAP 198.6 Method

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-30 *140806728-0075*	4" brown covebase	Tan			
Not Analyzed Final Residue <1% of original subsample, Non-ACM.					
Y6181-31 *140806728-0076*	4" brown covebase	Tan	100.0	None	Inconclusive: No Asbestos Detected
Y6181-32 *140806728-0077*	mastic for 4" brown covebase	Gray/Cream	100.0	None	Inconclusive: No Asbestos Detected
Y6181-33 *140806728-0078*	mastic for 4" brown covebase	Brown/Cream	100.0	None	Inconclusive: No Asbestos Detected
Y6181-34 *140806728-0079*	mastic for 4" brown covebase	Gray/Cream	100.0	None	Inconclusive: No Asbestos Detected
Y6181-35 *140806728-0080*	6" brown covebase	Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-36 *140806728-0081*	6" brown covebase	Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-37 *140806728-0082*	6" brown covebase	Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-38 *140806728-0083*	mastic for 6" brown covebase	Cream	100.0	None	Inconclusive: No Asbestos Detected

Analyst(s)
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Rhonda McGee

Rhonda McGee, Laboratory Manager
or other approved signatory

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Asbestos Analysis of Non-Friable Organically Bound Materials by PLM via the NY State ELAP 198.6 Method

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-39 *140806728-0084*	mastic for 6" brown covebase	Cream	100.0	None	Inconclusive: No Asbestos Detected
Y6181-40 *140806728-0085*	mastic for 6" brown covebase	Cream/Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-41 *140806728-0086*	carpet mastic	Tan/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-42 *140806728-0087*	carpet mastic	Tan/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-43 *140806728-0088*	carpet mastic	Tan/Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-60 *140806728-0089*	12x12 white floor tile, older stock	Tan/White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-61 *140806728-0090*	12x12 white floor tile, older stock	Tan/White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-62 *140806728-0091*	12x12 white floor tile, older stock	Tan/White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-63 *140806728-0092*	mastic for 12x12 white floor tile, older stock	Yellow/Black	98.8	None	1.2 Chrysotile 1.2 **Total All Types**

Analyst(s)
Tom Hanes (74)

Rhonda McGee
Rhonda McGee, Laboratory Manager
or other approved signatory

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Asbestos Analysis of Non-Friable Organically Bound Materials by PLM via the NY State ELAP 198.6 Method

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-64 *140806728-0093*	mastic for 12x12 white floor tile, older stock	Yellow/Black			
Not Analyzed Positive Stop.					
Y6181-65 *140806728-0094*	mastic for 12x12 white floor tile, older stock	Black			
Not Analyzed Positive Stop.					
Y6181-66 *140806728-0095*	brown stair tread	Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-67 *140806728-0096*	brown stair tread	Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-68 *140806728-0097*	brown stair tread	Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-69 *140806728-0098*	mastic for brown stair tread	Gray/Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-70 *140806728-0099*	mastic for brown stair tread	Cream/Brown			
Not Analyzed Final Residue <1% of original subsample, Non-ACM.					

Analyst(s)
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or other approved signatory

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Asbestos Analysis of Non-Friable Organically Bound Materials by PLM via the NY State ELAP 198.6 Method

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-71 *140806728-0100*	mastic for brown stair tread	Cream/Gray/Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-90 *140806728-0101*	door caulk white	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-91 *140806728-0102*	door caulk white	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-92 *140806728-0103*	door caulk white	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-93 *140806728-0104*	vinyl wall paper	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-94 *140806728-0105*	vinyl wall paper	Green/White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-95 *140806728-0106*	vinyl wall paper	Green/White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-96 *140806728-0107*	sink undercoat	Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-97 *140806728-0108*	sink undercoat	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-98 *140806728-0109*	sink undercoat	White	100.0	None	Inconclusive: No Asbestos Detected

Analyst(s)
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Asbestos Analysis of Non-Friable Organically Bound Materials by PLM via the NY State ELAP 198.6 Method

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-108 *140806728-0110*	4" black cove base	Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-109 *140806728-0111*	4" black cove base	Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-110 *140806728-0112*	4" black cove base	Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-111 *140806728-0113*	mastic for 4" black covebase	Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-112 *140806728-0114*	mastic for 4" black covebase	Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-113 *140806728-0115*	mastic for 4" black covebase	Black	100.0	None	Inconclusive: No Asbestos Detected
Y6181-114 *140806728-0116*	fire caulk red	Red	100.0	None	Inconclusive: No Asbestos Detected
Y6181-115 *140806728-0117*	fire caulk red	Red	100.0	None	Inconclusive: No Asbestos Detected
Y6181-116 *140806728-0118*	fire caulk red	Red	100.0	None	Inconclusive: No Asbestos Detected
Y6181-117 *140806728-0119*	9x9 floor tile	Beige	94.6	None	5.4 Chrysotile 5.4 **Total All Types**

Analyst(s)
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SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-118 *140806728-0120*	9x9 floor tile	Beige			
Not Analyzed Positive stop					
Y6181-119 *140806728-0121*	9x9 floor tile	Beige			
Not Analyzed Positive stop					
Y6181-120 *140806728-0122*	mastic for 9x9 floor tile	Black	96.6	None	3.4 Chrysotile **3.4 Total All Types**
Y6181-121 *140806728-0123*	mastic for 9x9 floor tile	Black			
Not Analyzed Positive stop					
Y6181-122 *140806728-0124*	mastic for 9x9 floor tile	Black			
Not Analyzed Positive stop					
Y6181-123 *140806728-0125*	16x16 floor tile	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-124 *140806728-0126*	16x16 floor tile	White	100.0	None	Inconclusive: No Asbestos Detected

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SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-125 *140806728-0127*	16x16 floor tile	White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-126 *140806728-0128*	mastic for 9x9 floor tile	Tan			
Not Analyzed Final Residue <1% of original subsample, Non-ACM.					
Y6181-127 *140806728-0129*	mastic for 9x9 floor tile	Yellow	100.0	None	Inconclusive: No Asbestos Detected
Y6181-128 *140806728-0130*	mastic for 9x9 floor tile	Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-129 *140806728-0131*	interior door caulk brown	Tan/Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-130 *140806728-0132*	interior door caulk brown	Gray/Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-131 *140806728-0133*	interior door caulk brown	Blue/Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-132 *140806728-0134*	slop sink caulk	Tan/White			
Not Analyzed Final Residue <1% of original subsample, Non-ACM.					

Analyst(s)

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Rhonda McGee

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SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
Y6181-133 *140806728-0135*	slop sink caulk	Gray/White	100.0	None	Inconclusive: No Asbestos Detected
Y6181-134 *140806728-0136*	slop sink caulk	Tan/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-135 *140806728-0137*	mastic for 1x1 ceiling tile	Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-136 *140806728-0138*	mastic for 1x1 ceiling tile	Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-137 *140806728-0139*	mastic for 1x1 ceiling tile	Brown	100.0	None	Inconclusive: No Asbestos Detected
Y6181-138 *140806728-0140*	interior expansion joint caulk	White/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-139 *140806728-0141*	interior expansion joint caulk	White/Gray	100.0	None	Inconclusive: No Asbestos Detected
Y6181-140 *140806728-0142*	interior expansion joint caulk	White/Gray	100.0	None	Inconclusive: No Asbestos Detected

Analyst(s)
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Asbestos Analysis of Non-Friable Organically Bound materials by Transmission Electron Microscopy via NYS ELAP Method 198.4

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES	% TOTAL ASBESTOS
Y6181-1 *140806728-0059*	AHU gasket seal	Black/Gray	100.0	None	No Asbestos Detected	
Y6181-2 *140806728-0060*	AHU gasket seal	Black/Gray	100.0	None	No Asbestos Detected	
Y6181-7 *140806728-0062*	lagging seal on fiberglass TSI	Tan/Cream	100.0	None	No Asbestos Detected	
Y6181-8a *140806728-0063*	lagging seal on fiberglass TSI	Tan/Cream	100.0	None	No Asbestos Detected	
Y6181-17 *140806728-0065*	AHU interior fiberglass insulation mastic	Rust/Yellow	100.0	None	No Asbestos Detected	
Unable to separate from insulation						
Y6181-19 *140806728-0067*	AHU interior fiberglass insulation mastic	Rust/Yellow	100.0	None	No Asbestos Detected	
Unable to separate from insulation						
Y6181-20 *140806728-0068*	12x12 white fl tile, newer stock	White	100.0	None	No Asbestos Detected	
Y6181-21 *140806728-0069*	12x12 white fl tile, newer stock	White	100.0	None	No Asbestos Detected	

Analyst(s)
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Analysis Date: 1/5/2009
Report Date: 1/9/2009

Asbestos Analysis of Non-Friable Organically Bound materials by Transmission Electron Microscopy via NYS ELAP Method 198.4

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES	% TOTAL ASBESTOS
Y6181-23 *140806728-0071*	mastic for 12x12 white floor tile, newer stock	Yellow/Black	100.0	None	No Asbestos Detected	
Y6181-24 *140806728-0072*	mastic for 12x12 white floor tile, newer stock	Yellow/Black	100.0	None	No Asbestos Detected	
Y6181-29 *140806728-0074*	4" brown covebase	Tan	100.0	None	No Asbestos Detected	
Y6181-31 *140806728-0076*	4" brown covebase	Tan	100.0	None	No Asbestos Detected	
Y6181-32 *140806728-0077*	mastic for 4" brown covebase	Gray/Cream	100.0	None	No Asbestos Detected	
Y6181-33 *140806728-0078*	mastic for 4" brown covebase	Brown/Cream	100.0	None	No Asbestos Detected	
Y6181-35 *140806728-0080*	6" brown covebase	Brown	100.0	None	No Asbestos Detected	
Y6181-36 *140806728-0081*	6" brown covebase	Brown	100.0	None	No Asbestos Detected	
Y6181-38 *140806728-0083*	mastic for 6" brown covebase	Cream	100.0	None	No Asbestos Detected	

Analyst(s)
Tom Hanes (50)

Rhonda McGee

Rhonda McGee, Laboratory Manager
or other approved signatory

EMSL Analytical, Inc.
490 Rowley Road, Depew, NY 14043
Phone: (716) 651-0030 Fax: 7166510394 Email: buffalolab@emsl.com

Attn: **Kevin Janik**
Watts Architecture & Engineering, P.C.
3826 Main Street
Buffalo, NY 14226

Fax (716) 836-2402 Phone: (716) 836-1540

Project: **Y6181.04 / SUNY New Paltz, Deyo Hall Program Study, Deyo Hall**

Customer ID: WATT50
Customer PO:
Received: 12/30/08 9:37 AM
EMSL Order: 140806728

EMSL Proj:
Analysis Date: 1/5/2009
Report Date: 1/9/2009

Asbestos Analysis of Non-Friable Organically Bound materials by Transmission Electron Microscopy via NYS ELAP Method 198.4

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES	% TOTAL ASBESTOS
Y6181-39 *140806728-0084*	mastic for 6" brown covebase	Cream	100.0	None	No Asbestos Detected	
Y6181-41 *140806728-0086*	carpet mastic	Tan/Gray	100.0	None	No Asbestos Detected	
Y6181-42 *140806728-0087*	carpet mastic	Tan/Gray	100.0	None	No Asbestos Detected	
Y6181-60 *140806728-0089*	12x12 white floor tile, older stock	Tan/White	100.0	None	No Asbestos Detected	
Y6181-61 *140806728-0090*	12x12 white floor tile, older stock	Tan/White	100.0	None	No Asbestos Detected	
Y6181-66 *140806728-0095*	brown stair tread	Brown	100.0	None	No Asbestos Detected	
Y6181-68 *140806728-0097*	brown stair tread	Brown	100.0	None	No Asbestos Detected	
Y6181-69 *140806728-0098*	mastic for brown stair tread	Gray/Brown	100.0	None	No Asbestos Detected	
Y6181-71 *140806728-0100*	mastic for brown stair tread	Cream/Gray/Brown	100.0	None	No Asbestos Detected	
Y6181-90 *140806728-0101*	door caulk white	White	100.0	None	No Asbestos Detected	

Analyst(s)

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SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES	% TOTAL ASBESTOS
Y6181-91 *140806728-0102*	door caulk white	White	100.0	None	No Asbestos Detected	
Y6181-93 *140806728-0104*	vinyl wall paper	White	100.0	None	No Asbestos Detected	
Y6181-95 *140806728-0106*	vinyl wall paper	Green/White	100.0	None	No Asbestos Detected	
Y6181-96 *140806728-0107*	sink undercoat	Black	100.0	None	No Asbestos Detected	
Y6181-97 *140806728-0108*	sink undercoat	White	100.0	None	No Asbestos Detected	
Y6181-108 *140806728-0110*	4" black cove base	Black	100.0	None	No Asbestos Detected	
Y6181-109 *140806728-0111*	4" black cove base	Black	100.0	None	No Asbestos Detected	
Y6181-111 *140806728-0113*	mastic for 4" black covebase	Black	100.0	None	No Asbestos Detected	
Y6181-112 *140806728-0114*	mastic for 4" black covebase	Black	100.0	None	No Asbestos Detected	
Y6181-114 *140806728-0116*	fire caulk red	Red	100.0	None	No Asbestos Detected	

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SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES	% TOTAL ASBESTOS
Y6181-115 *140806728-0117*	fire caulk red	Red	100.0	None	No Asbestos Detected	
Y6181-123 *140806728-0125*	16x16 floor tile	White	100.0	None	No Asbestos Detected	
Y6181-125 *140806728-0127*	16x16 floor tile	White	100.0	None	No Asbestos Detected	
Y6181-127 *140806728-0129*	mastic for 9x9 floor tile	Yellow	100.0	None	No Asbestos Detected	
Y6181-128 *140806728-0130*	mastic for 9x9 floor tile	Gray	100.0	None	No Asbestos Detected	
Y6181-129 *140806728-0131*	interior door caulk brown	Tan/Brown	100.0	None	No Asbestos Detected	
Y6181-130 *140806728-0132*	interior door caulk brown	Gray/Brown	100.0	None	No Asbestos Detected	
Y6181-133 *140806728-0135*	slop sink caulk	Gray/White	100.0	None	No Asbestos Detected	
Y6181-134 *140806728-0136*	slop sink caulk	Tan/Gray	100.0	None	No Asbestos Detected	
Y6181-135 *140806728-0137*	mastic for 1x1 ceiling tile	Brown	100.0	None	No Asbestos Detected	

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Asbestos Analysis of Non-Friable Organically Bound materials by Transmission Electron Microscopy via NYS ELAP Method 198.4

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES	% TOTAL ASBESTOS
Y6181-136 *140806728-0138*	mastic for 1x1 ceiling tile	Brown	100.0	None	No Asbestos Detected	
Y6181-138 *140806728-0140*	interior expansion joint caulk	White/Gray	100.0	None	No Asbestos Detected	
Y6181-139 *140806728-0141*	interior expansion joint caulk	White/Gray	100.0	None	No Asbestos Detected	

Analyst(s)
Tom Hanes (50)

Rhonda McGee

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THIS IS THE LAST PAGE OF THE REPORT.

EMSL Analytical, Inc.
490 Rowley Road, Depew, NY 14043
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Asbestos Analysis of Bulk Material

Attn: **Kevin Janik**
Watts Architecture & Engineering, P.C.
3826 Main Street
Buffalo, NY 14226

Fax: (716) 836-2402 Phone: (716) 836-1540
Project: **Y6181.04 / SUNY New Paltz, Deyo Hall Program Study Revision 1**

Customer ID: WATT50
Customer PO:
Received: 01/16/09 10:01 AM
EMSL Order: 140900217
EMSL Proj:
Report Date: 1/26/2009

Sample Description	Test	Analyzed Date	Color	Non Asbestos Fibroue	Non-Fibrous	Asbestos	Comments
Y6181-98a	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0001	**PLM NYS 198.6 NOB**	1/17/2009	Cream		N/A	**Inconclusive: None Detected**	
apt 14 kitchen sink	**TEM NYS 198.4 NOB**	1/26/2009	Cream		N/A	**None Detected**	
Y6181-96a	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0002	**PLM NYS 198.6 NOB**	1/17/2009	Black		N/A	**Inconclusive: None Detected**	
sink under coat, black	**TEM NYS 198.4 NOB**	1/19/2009	Black		N/A	**None Detected**	
Y6181-96b	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0003	**PLM NYS 198.6 NOB**	1/17/2009	Black		N/A	**Inconclusive: None Detected**	Below recommended method minimum sample amount.
sink under coat, black	**TEM NYS 198.4 NOB**	1/19/2009	Black		N/A	**None Detected**	Below recommended method minimum sample amount.
Y6181-144	**PLM NYS 198.1 Friable**	1/19/2009	Gray	40.00% Cellulose	60%	**None Detected**	
140900217-0004	**PLM NYS 198.6 NOB**				N/A		Not Analyzed
exterior skim coat concrete	**TEM NYS 198.4 NOB**				N/A		Not Analyzed
Y6181-141	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0005	**PLM NYS 198.6 NOB**	1/17/2009	Yellow		N/A	**Inconclusive: None Detected**	Unable to separate from tile.
residual mastic from 9x9 floor tiles removed in 06	**TEM NYS 198.4 NOB**				N/A		Not Analyzed
Y6181-142	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0006	**PLM NYS 198.6 NOB**	1/17/2009	Gray/Black		N/A	**Inconclusive: None Detected**	Unable to separate from tile.
residual mastic from 9x9 floor tiles removed in 06	**TEM NYS 198.4 NOB**				N/A		Not Analyzed
Y6181-143	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0007	**PLM NYS 198.6 NOB**	1/17/2009	Black		N/A	2.3% Chrysotile **2.3% Total**	Unable to separate from tile
residual mastic from 9x9 floor tiles removed in 06	**TEM NYS 198.4 NOB**				N/A		Not Analyzed

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Project: **Y6181.04 / SUNY New Paltz, Deyo Hall Program Study Revision 1**

Customer ID: WATT50
Customer PO:
Received: 01/16/09 10:01 AM
EMSL Order: 140900217
EMSL Proj:
Report Date: 1/26/2009

Asbestos Analysis of Bulk Material

Sample Description	Test	Analyzed Date	Color	Non Asbestos Fibrous	Non Asbestos Non-Fibrous	Asbestos	Comments
Y6181-145	**PLM NYS 198.1 Friable**	1/19/2009	Gray	30.00% Cellulose	70%	**None Detected**	
140900217-0008	**PLM NYS 198.6 NOB**				N/A		Not Analyzed
exterior skim coat concrete	**TEM NYS 198.4 NOB**				N/A		Not Analyzed
Y6181-146	**PLM NYS 198.1 Friable**	1/19/2009	Gray	40.00% Cellulose	60%	**None Detected**	
140900217-0009	**PLM NYS 198.6 NOB**				N/A		Not Analyzed
exterior skim coat concrete	**TEM NYS 198.4 NOB**				N/A		Not Analyzed
Y6181-147	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0010	**PLM NYS 198.6 NOB**	1/17/2009	Gray		N/A	**Inconclusive: None Detected**	Unable to separate from tile
mastic beneath blue rubber tile in elevator	**TEM NYS 198.4 NOB**	1/19/2009	Gray		N/A	**None Detected**	Unable to separate from tile
Y6181-148	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0011	**PLM NYS 198.6 NOB**	1/17/2009	Cream/Gray		N/A	**Inconclusive: None Detected**	Unable to separate from tile
mastic beneath blue rubber tile in elevator	**TEM NYS 198.4 NOB**	1/19/2009	Cream/Gray		N/A	**None Detected**	Unable to separate from tile
Y6181-149	**PLM NYS 198.1 Friable**						Not Analyzed
140900217-0012	**PLM NYS 198.6 NOB**	1/17/2009	Gray		N/A	**Inconclusive: None Detected**	Unable to separate tile
mastic beneath blue rubber tile in elevator	**TEM NYS 198.4 NOB**				N/A		Not Analyzed

EMSL Analytical, Inc.
490 Rowley Road, Depew, NY 14043
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Asbestos Analysis of Bulk Material

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Project: **Y6181.04 / SUNY New Paltz, Deyo Hall Program Study Revision 1**

Customer ID:	WATT50
Customer PO:	
Received:	01/16/09 10:01 AM
EMSL Order:	140900217
EMSL Proj:	
Report Date:	1/26/2009

Sample Description	Test	Analyzed Date	Color	Non Asbestos Fibrous	Non Asbestos Non-Fibrous	Asbestos	Comments

Sample 98a test changed from 198.1 to 198.6/ 198.4

NOB = Non Friable Organically Bound
N/A = Not Applicable

Rhonda McGee

Rhonda McGee, Laboratory Manager
or other approved signatory

Analyst(s)

Andrew Maciejewski
Lucia Esquilin
Rachel Giese

ACCREDITATIONS: NVLAP #200056-0 and NY STATE ELAP #11606

1408061728

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Architecture +
Project: SUNY New Paltz - Deyo Hall Program Study
Building / Location: Deyo Hall
Contact: Scott Matthews at (315) 443-8611
Email Preliminary Results to: smatthews@watts-ae.com
Mail Report & Invoice to: Kevin Janik
Watts Architecture & Engineering, P.C.
3826 Main Street, Buffalo, New York

Date: 12/27/2008
Watts Project No.: Y6181.04

Turnaround Requested: ___ 3 Hr. ___ 48 Hr.
Analysis Requested: ___ 6 Hr. ___ 72 Hr.
PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results	
			PLM	TEM
Y6181-1	AHU Gasket Seal	Mech Room AHU		
Y6181-2	AHU Gasket Seal	Mech Room AHU		
Y6181-3	AHU Gasket Seal	Mech Room AHU		
Y6181-4	Mud Fitting	Mech Room Valve over AHU	+	
Y6181-5	Mud Fitting	Mech Room HW Supply over Pumps		
Y6181-6	Mud Fitting	Mech Room Back Side of AHUs		
Y6181-7	Lagging Seal on Fiberglass TSI	Mech Room TSI		
Y6181-8a	Lagging Seal on Fiberglass TSI	Mech Room TSI		
Y6181-8b	Lagging Seal on Fiberglass TSI	Mech Room TSI		
Y6181-9	Tank Insulation	Mech Room Tank	+	
Y6181-10	Tank Insulation	Mech Room Tank		
Y6181-11	Tank Insulation	Mech Room Tank		

Sampled By: Scott Matthews Date: ~~12/23/2008~~

12-30-08 09:37 RCVD

Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: FE Date:

Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

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12/28/2008

1408061728

1408067 28

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Architecture +
Project: SUNY New Paltz - Deyo Hall Program Study
Building / Location: Deyo Hall
Contact: Scott Matthews at (315) 443-8611
Email Preliminary Results to: smatthews@watts-ae.com
Mail Report & Invoice to: Kevin Janik
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Turnaround Requested: Analysis Requested: PLM X TEM X

3 Hr.	48 Hr.
6 Hr.	72 Hr.
12 Hr.	X 5 Day
24 Hr.	6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results PLM	Laboratory Results TEM
Y6181-12	Press Board Ceiling	Mech Room		
Y6181-13a	Press Boord Ceiling	Mech Room		
Y6181-13b	Press Board Ceiling	Mech Room		
Y6181-14	Cloth Vibration Dampener	Mech Room AHU		
Y6181-15	Cloth Vibration Dampener	Mech Room AHU		
Y6181-16	Cloth Vibration Dampener	Laundry Room		
Y6181-17	AHU Interior Fiberglass Insulation Mastic	Mech Room AHU		
Y6181-18	AHU Interior Fiberglass Insulation Mastic	Mech Room AHU		
Y6181-19	AHU Interior Fiberglass Insulation Mastic	Mech Room AHU		
Y6181-20	12x12 White Floor Tile (Newer Stock)	Basement Linnen Room		
Y6181-21	12x12 White Floor Tile (Newer Stock)	Basement Western Vestibule		
Y6181-22	12x12 White Floor Tile (Newer Stock)	Third Floor Stairwell		

Sampled By: Scott Matthews Date: 12/23/2008

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Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

140806728

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PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results	
			PLM	TEM
Y6181-23	Mastic for 12x12 White Floor Tile (Newer Stock)	Basement Linnen Room		
Y6181-24	Mastic for 12x12 White Floor Tile (Newer Stock)	Basement Western Vestibule		
Y6181-25	Mastic for 12x12 White Floor Tile (Newer Stock)	Third Floor Stairwell		
Y6181-26	1x1 Ceiling Tile	Basement Corridor		
Y6181-27	1x1 Ceiling Tile	Hall 115		
Y6181-28	1x1 Ceiling Tile	Hall 315		
Y6181-29	4" Brown Covebase	Laundry Room SEC		
Y6181-30	4" Brown Covebase	Room 127 SEC		
Y6181-31	4" Brown Covebase	Corridor Outside 024		
Y6181-32	Mastic for 4" Brown Covebase	Laundry Room SEC		
Y6181-33	Mastic for 4" Brown Covebase	Room 127 SEC		
Y6181-34	Mastic for 4" Brown Covebase	Corridor Outside 024		

Sampled By: Scott Matthews Date: 12/23/2008
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Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

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PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results PLM	Laboratory Results TEM
Y6181-35	6" Brown Covebase	Rec Room East Door		
Y6181-36	6" Brown Covebase	Hall 115 at Bathroom Corner		
Y6181-37	6" Brown Covebase	Hall 315 at Bathroom Corner		
Y6181-38	Mastic for 6" Brown Covebase	Rec Room East Door		
Y6181-39	Mastic for 6" Brown Covebase	Hall 115 at Bathroom Corner		
Y6181-40	Mastic for 6" Brown Covebase	Hall 315 at Bathroom Corner		
Y6181-41	Carpet Mastic	Hall 15 Center		
Y6181-42	Carpet Mastic	Hall 115 Outside Room 114		
Y6181-43	Carpet Mastic	Hall 315 Center		
Y6181-44	Sheetrock Drywall	Rec Room Pipe Chase		
Y6181-45	Sheetrock Drywall	Hall 15 at Elec Panel		
Y6181-46	Sheetrock Drywall	Kitchen Room 14		

Sampled By: Scott Matthews Date: 12/23/2008
Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: FC Date:

Comments: Anolyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

140806728

1408066728

Page: 5 of 12

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

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Watts Project No.: Y6181.04

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PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results	
			PLM	TEM
Y6181-47	Stair Compound	Center Stairwell 2nd Level		
Y6181-48	Stair Compound	Center Stairwell 1st Level		
Y6181-49	Stair Compound	Center Stairwell Basement Level		
Y6181-50	Drywall Joint Compound	Hall 15 at Elec Panel		
Y6181-51	Drywall Joint Compound	Hall 315 at Water Fountain		
Y6181-52	Drywall Joint Compound	Corridor 300 at Ceiling		
Y6181-53	Spray-on Popcorn Ceiling Insulation	Bathroom 3		
Y6181-54	Spray-on Popcorn Ceiling Insulation	Western Vestibule	+	
Y6181-55	Spray-on Popcorn Ceiling Insulation	Room 114		
Y6181-56	Spray-on Popcorn Ceiling Insulation	2nd Floor Stairwell		
Y6181-57	Spray-on Popcorn Ceiling Insulation	Room 211		
Y6181-58	Spray-on Popcorn Ceiling Insulation	Room 311		

Sampled By: Scott Matthews Date: 12/23/2008

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Page: 6 of 12

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Architecture +
Project: SUNY New Paltz - Deyo Hall Program Study
Building / Location: Deyo Hall
Contact: Scott Matthews at (315) 443-8611
Email Preliminary Results to: smatthews@watts-ae.com
Mail Report & Invoice to: Kevin Janik
Watts Architecture & Engineering, P.C.
3826 Main Street, Buffalo, New York

Date: 12/27/2008
Watts Project No.: Y6181.04

Turnaround Requested: ___ 3 Hr. ___ 48 Hr.
Analysis Requested: ___ 6 Hr. ___ 72 Hr.
PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results PLM	Laboratory Results TEM
Y6181-59	Spray-on Popcorn Ceiling Insulation	Room 324		
Y6181-60	12x12 White Floor Tile (older stock)	Bedroom 114b		
Y6181-61	12x12 White Floor Tile (older stock)	Room 322		
Y6181-62	12x12 White Floor Tile (older stock)	Room 324		
Y6181-63	Mastic for 12x12 White Floor Tile (older stock)	Bedroom 114b	+	
Y6181-64	Mastic for 12x12 White Floor Tile (older stock)	Room 322	+	
Y6181-65	Mastic for 12x12 White Floor Tile (older stock)	Room 324	+	
Y6181-66	Brown Stair Tread	Stairwell Western Vestibule		
Y6181-67	Brown Stair Tread	Stairwell Eastern Vestibule		
Y6181-68	Brown Stair Tread	Stairwell 2nd Floor		
Y6181-69	Mastic For Brown Stair Tread	Stairwell Western Vestibule		
Y6181-70	Mastic For Brown Stair Tread	Stairwell Eastern Vestibule		

Sampled By: Scott Matthews Date: 12/23/2008
Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: Date:

Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

1408006728

1408061728

Page: 7 of 12

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

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Date: 12/27/2008

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3826 Main Street, Buffalo, New York

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	3 Hr.		48 Hr.
	6 Hr.		72 Hr.
PLM X TEM X	12 Hr.	X	5 Day
	24 Hr.		6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results	
			PLM	TEM
Y6181-71	Mastic For Brown Stair Tread	Stairwell 2nd Floor		
Y6181-72	4x4 Ceramic Tile Grout	JC 17		
Y6181-73	4x4 Ceramic Tile Grout	JC 117		
Y6181-74	4x4 Ceramic Tile Grout	Bath 128		
Y6181-75	4x4 Ceramic Tile Mudset	JC 17		
Y6181-76	4x4 Ceramic Tile Mudset	JC 117		
Y6181-77	4x4 Ceramic Tile Mudset	Bath 128		
Y6181-78	1x2 Cermic Tile Grout	JC 17		
Y6181-79	1x2 Cermic Tile Grout	JC 217		
Y6181-80	1x2 Cermic Tile Grout	JC 308		
Y6181-81	1x2 Cermic Tile Mortar	JC 17		
Y6181-82	1x2 Cermic Tile Mortar	JC 217		

Sampled By: Scott Matthews Date: 12/23/2008

Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: Date:

Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

140806728

1408061728

Page: 8 of 12

WATTS ARCHITECTURE & ENGINEERING, P.C.
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Analysis Requested: ___ 6 Hr. ___ 72 Hr.
PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results PLM	TEM
Y6181-83	1x2 Cermic Tile Mortar	JC 308		
Y6181-84	Canvas Duct Wrap	Mechanical Room		
Y6181-85	Canvas Duct Wrap	Mechanical Room		
Y6181-86	Canvas Duct Wrap	Mechanical Room		
Y6181-87	Canvas Pipe Wrap	Mechanical Room		
Y6181-88	Canvas Pipe Wrap	Transhroom 9		
Y6181-89	Canvas Pipe Wrap	Elevevator Room 4		
Y6181-90	Door Caulk (White)	Mens Room 3		
Y6181-91	Door Caulk (White)	Womens Room 2		
Y6181-92	Door Caulk (White)	JC 117		
Y6181-93	Vinyl Wall Paper	Hall Government 127		
Y6181-94	Vinyl Wall Paper	1st Floor Central Stairwell		

PCBs X1,590

Sampled By: Scott Matthews Date: 12/23/2008

Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: _____ Date: _____

Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

1408066728

Page: 9 of 12

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Architecture +

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Building / Location: Deyo Hall

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3826 Main Street, Buffalo, New York

Date: 12/27/2008

Watts Project No.: Y6181.04

Turnaround Requested: ___ 3 Hr. ___ 48 Hr.
Analysis Requested: ___ 6 Hr. ___ 72 Hr.
PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results PLM	TEM
Y6181-95	Vinyl Wall Paper	1st Floor Central Stairwell		
Y6181-96	Sink Undercoat	Rec Room		
Y6181-97	Sink Undercoat	Apt 14 Kitchen		
Y6181-98	Sink Undercoat	Apt 14 Kitchen		
Y6181-99	Skim Coat Plaster on Concrete Column	Hall 115		
Y6181-100	Skim Coat Plaster on Concrete Column	Hall 215		
Y6181-101	Skim Coat Plaster on Concrete Column	Hall 315		
Y6181-102	Quarry Tile Mortar	Lounge 125 Entrance		
Y6181-103	Quarry Tile Mortar	Lounge 125 Entrance		
Y6181-104	Quarry Tile Mortar	Lounge 125 Entrance		
Y6181-105	Terrazzo Shower Base	Bathroom 12		
Y6181-106	Terrazzo Shower Base	Bathroom 114		

Sampled By: Scott Matthews Date: 12/23/2008

Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: _____ Date: _____

Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

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Client: Architecture +

Date: 12/27/2008

Project: SUNY New Paltz - Deyo Hall Program Study

Watts Project No.: Y6181.04

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Turnaround Requested: ___ 3 Hr. ___ 48 Hr.
Analysis Requested: ___ 6 Hr. ___ 72 Hr.
PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results	
			PLM	TEM
Y6181-107	Terrazzo Shower Base	Bathroom 214		
Y6181-108	4" Black Cove Base	Room 12		
Y6181-109	4" Black Cove Base	Room 114		
Y6181-110	4" Black Cove Base	Room 214		
Y6181-111	Mastic for 4" Black Cove Base	Room 12		
Y6181-112	Mastic for 4" Black Cove Base	Room 114		
Y6181-113	Mastic for 4" Black Cove Base	Room 214		
Y6181-114	Fire Caulk (red)	Mechanical Room		
Y6181-115	Fire Caulk (red)	Elevator Room		
Y6181-116	Fire Caulk (red)	Elevator Room		
Y6181-117	9x9 Floor Tile	Linen Room	+	
Y6181-118	9x9 Floor Tile	Room 114b		

Sampled By: Scott Matthews Date: 12/23/2008

Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: FED EX Date: ___

Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

1408066728

Client: Architecture +
Project: SUNY New Paltz - Deyo Hall Program Study
Building / Location: Deyo Hall
Contact: Scott Matthews at (315) 443-8611
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Mail Report & Invoice to: Kevin Janik
Watts Architecture & Engineering, P.C.
3826 Main Street, Buffalo, New York

Date: 12/27/2008
Watts Project No.: Y6181.04

Turnaround Requested: ___ 3 Hr. ___ 48 Hr.
Analysis Requested: ___ 6 Hr. ___ 72 Hr.
PLM X TEM X ___ 12 Hr. X 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results	
			PLM	TEM
Y6181-119	9x9 Floor Tile	Room 112		
Y6181-120	Mastic for 9x9 Floor Tile	Linen Room	+	
Y6181-121	Mastic for 9x9 Floor Tile	Room 114b		
Y6181-122	Mastic for 9x9 Floor Tile	Room 112		
Y6181-123	16x16 Floor Tile	Rec Room		
Y6181-124	16x16 Floor Tile	Hall 115 Corner next to Bathroom		
Y6181-125	16x16 Floor Tile	Hall 215 Corner next to Bathroom		
Y6181-126	Mastic for ~~9x9~~ 16x16 Floor Tile	Rec Room		
Y6181-127	Mastic for ~~9x9~~ 16x16 Floor Tile	Hall 115 Corner next to Bathroom		
Y6181-128	Mastic for ~~9x9~~ 16x16 Floor Tile	Hall 215 Corner next to Bathroom		
Y6181-129	Interior Door Caulk (brown)	West Vestibule to Hall 15		
Y6181-130	Interior Door Caulk (brown)	West Vestibule Entrance		

PCBs: 3,570

Sampled By: Scott Matthews Date: ~~12/23/2008~~
Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: FE Date:

Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

140806728

Client: Architecture +

Date: 12/27/2008

Project: SUNY New Paltz - Deyo Hall Program Study

Watts Project No.: Y6181.04

Building / Location: Deyo Hall

Contact: Scott Matthews at (315) 443-8611

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3826 Main Street, Buffalo, New York

Turnaround Requested / Analysis Requested:

	3 Hr.		48 Hr.
	6 Hr.		72 Hr.
PLM X TEM X	12 Hr.	X	5 Day
	24 Hr.		6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results PLM	Laboratory Results TEM
Y6181-131	Interior Door Caulk (brown)	East Vestibule to Corridor		
Y6181-132	Slop Sink Caulk	Janitorial Closet 114		
Y6181-133	Slop Sink Caulk	Janitorial Closet 217		
Y6181-134	Slop Sink Caulk	Janitorial Closet 317		
Y6181-135	Mastic for 1x1 Ceiling Tile	Corridor 300 Next to Western Skylight		
Y6181-136	Mastic for 1x1 Ceiling Tile	Corridor 300 Next to Central Skylight		
Y6181-137	Mastic for 1x1 Ceiling Tile	Corridor 300 Next to Central Skylight		
Y6181-138	Interior Expansion Joint Caulk	Entrance to Main Lounge 126		
Y6181-139	Interior Expansion Joint Caulk	Entrance to Main Lounge 126		
Y6181-140	Interior Expansion Joint Caulk	Entrance to Main Lounge 126		
~~XY6181-141~~	*(Note - Sample 141 was previously re-assigned as Sample No. 6a to maintain groupings. Please refer to Sample No. 6a herinafter)*			
~~XY6181-142~~	*(Note - Sample 142 was previously re-assigned as Sample No. 13a to maintain groupings. Please refer to Sample No. 13a herinafter)*			

PCBs = 2.5

Sampled By: Scott Matthews Date: 12/23/2008

Relinquished By: Scott Matthews (to Fed-Ex) Date: 12/27/2008 Received By: FEDEX Date:

Comments: Analyze each set of three to positive stop. If entire set of three negative by PLM, only analyze first two by TEM.

140806728

WATTS ARCHITECTURE & ENGINEERING, P.C.
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: Architecture +
Project: SUNY New Paltz - Deyo Hall Program Study
Building / Location: Deyo Hall
Contact: Scott Matthews at (315) 443-8611
Email Preliminary Results to: smatthews@watts-ae.com
Mail Report & Invoice to: Kevin Janik
Watts Architecture & Engineering, P.C.
3826 Main Street, Buffalo, New York

Date: 1/15/2009
Watts Project No.: Y6181.04

Turnaround Requested: ___ 3 Hr. ___ 48 Hr.
Analysis Requested: ___ 6 Hr. X 72 Hr.
PLM X TEM X ___ 12 Hr. ___ 5 Day
___ 24 Hr. ___ 6-10 Day

Sample Number	Material Description	Sample Location	Laboratory Results	
			PLM	TEM
Y6181-96a	Sink Undercoat (Black)	Ground Floor Rec Room Sink		
Y6181-96b	Sink Undercoat (Black)	Ground Floor Rec Room Sink		
Y6181-98o	Sink Undercoat (White)	Apt 14 Kitchen Sink		
Y6181-141	Residual Mastic from 9x9 Floor Tiles Removed in 2006	Laundry Room 5 - East Side Between Washing Machines		
Y6181-142	Residual Mastic from 9x9 Floor Tiles Removed in 2006	Beneath Carpet - West End of Main Corridor		
Y6181-143	Residual Mastic from 9x9 Floor Tiles Removed in 2006	Top of 2nd Floor Central Stairwell		
Y6181-144	Exterior Skim Coat Concrete	Main Entrance Exterior Soffit - West Side		
Y6181-145	Exterior Skim Coat Concrete	Main Entrance Exterior Soffit - East Side		
Y6181-146	Exterior Skim Coat Concrete	Main Entrance Exterior Soffit - East Side		
Y6181-147	Mastic Beneath Blue Rubber Tile in Elevator	Elevator		
XY6181-148	Mastic Beneath Blue Rubber Tile in Elevator	Elevator		
XY6181-149	Mastic Beneath Blue Rubber Tile in Elevator	Elevator		

Sampled By: Scott Matthews Date: 1/14/2009
Relinquished By: Scott Matthews (to Fed-Ex) Date: 1/15/2009 Received By: _____ Date: _____

Comments: Samples 96a and 96b: Analyze to positive stop. If both negative by PLM, only analyze 96a by TEM. Sample 98a: If negative by PLM, analyze by TEM.
Samples 141 thru 149: Analyze each set of three by PLM to positive stop. If each entire set of three negative by PLM, analyze first two in each set by TEM.

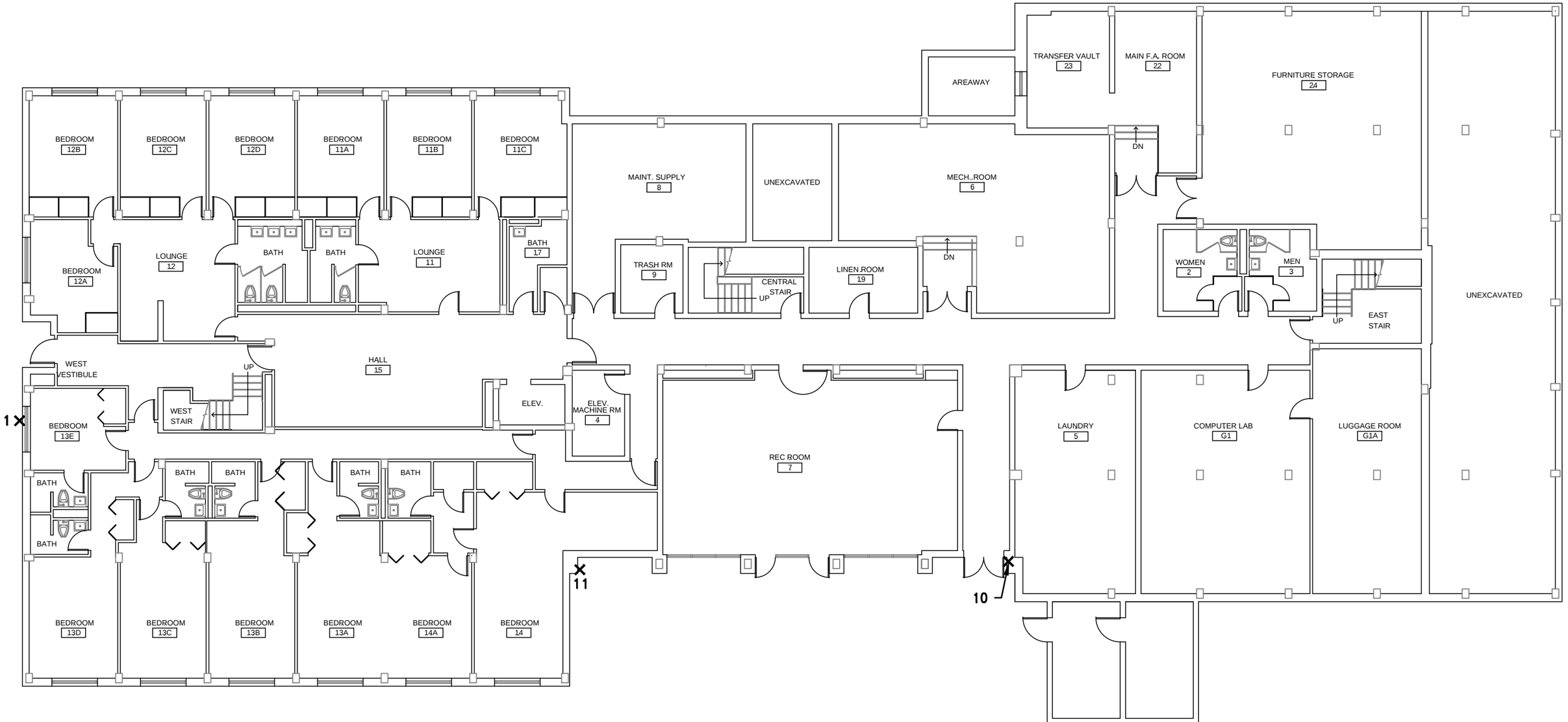
3.0 – POLYCHLORINATED BIPHENYLS IN CAULK

POLYCHLORINATED BIPHENYLS (PCBs)
DEYO HALL RENOVATION
STATE UNIVERSITY COLLEGE AT NEW PALTZ
DASNY PROJECT NO. 341830

PCB Concentration (mg/Kg or ppm)										
Sample Number	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Sample Description
17171-PCB-1	**<387**	**<387**	**<387**	**<387**	**<387**	**2,660**	**<387**	**<387**	**<387**	**Beige exterior window caulk**
17171-PCB-2	**<824**	**<824**	**<824**	**<824**	**<824**	**21,100**	**<824**	**<824**	**<824**	**Brown interior window glazing compound**
17171-PCB-3	<0.803	<0.803	<0.803	<0.803	<0.803	15.4	<0.803	<0.803	<0.803	Black interior window glazing compound
17171-PCB-4	<0.298	<0.298	<0.298	<0.298	<0.298	2.52	<0.298	<0.298	<0.298	Grey interior window glazing compound
17171-PCB-5	**<181**	**<181**	**<181**	**<181**	**<181**	**<181**	**<181**	**<181**	**1,990**	**White bathroom floor control joint caulk**
17171-PCB-6	<0.484	<0.484	<0.484	<0.484	<0.484	1.18	<0.484	<0.484	<0.484	Reddish/tan counterflashing caulk
17171-PCB-7	**<7.04**	**<7.04**	**<7.04**	**<7.04**	**<7.04**	**108**	**<7.04**	**<7.04**	**<7.04**	**White door caulk**
17171-PCB-8	**<2,520**	**<2,520**	**<2,520**	**<2,520**	**<2,520**	**43,700**	**<2,520**	**<2,520**	**<2,520**	**Grey exterior masonry control joint caulk**
17171-PCB-9	<2.41	<2.41	<2.41	<2.41	<2.41	9.20	<2.41	<2.41	<2.41	Brittle black slate panel joint caulk
17171-PCB-10	**<1,880**	**<1,880**	**<1,880**	**<1,880**	**<1,880**	**47,300**	**<1,880**	**<1,880**	**<1,880**	**Brown door caulk**
17171-PCB-11	**<2,190**	**<2,190**	**<2,190**	**<2,190**	**<2,190**	**28,400**	**<2,190**	**<2,190**	**<2,190**	**Brown exterior masonry control joint caulk**

Abbreviations:
Bold - PCB > 50 ppm
ND = Not Detected
mg/kg = milligrams per kilogram
ppm = parts per million

3.1 – PCB SAMPLE LOCATION DRAWINGS



BASEMENT PLAN

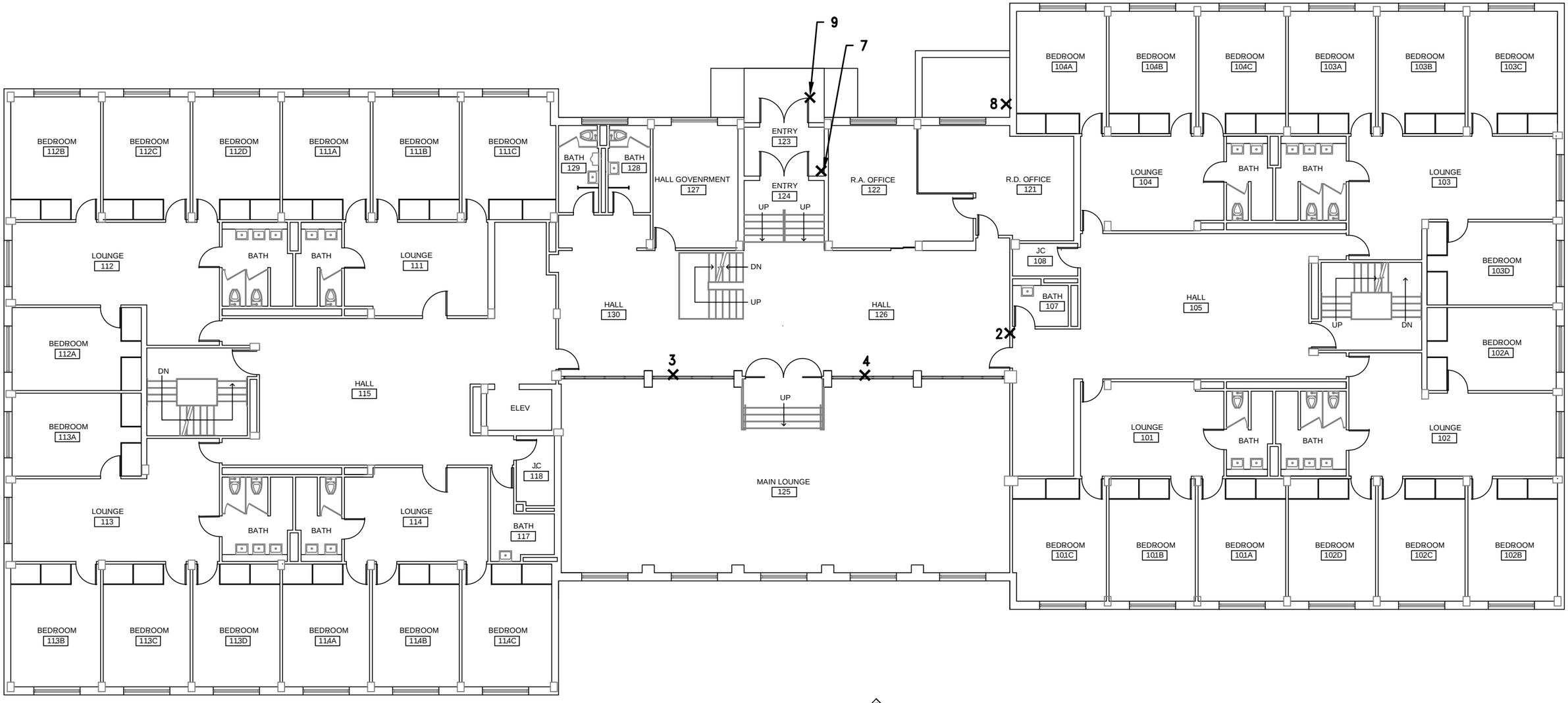
SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171-PCB-**
× INDICATES APPROXIMATE SAMPLE LOCATION

PCB SAMPLE LOCATIONS
BASEMENT

WATTS ARCHITECTURE & ENGINEERING
95 Perry Street Suite 300
Buffalo, New York 14203
(716) 206-5100 | (716) 206-5199 Fax

DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018



FIRST FLOOR PLAN

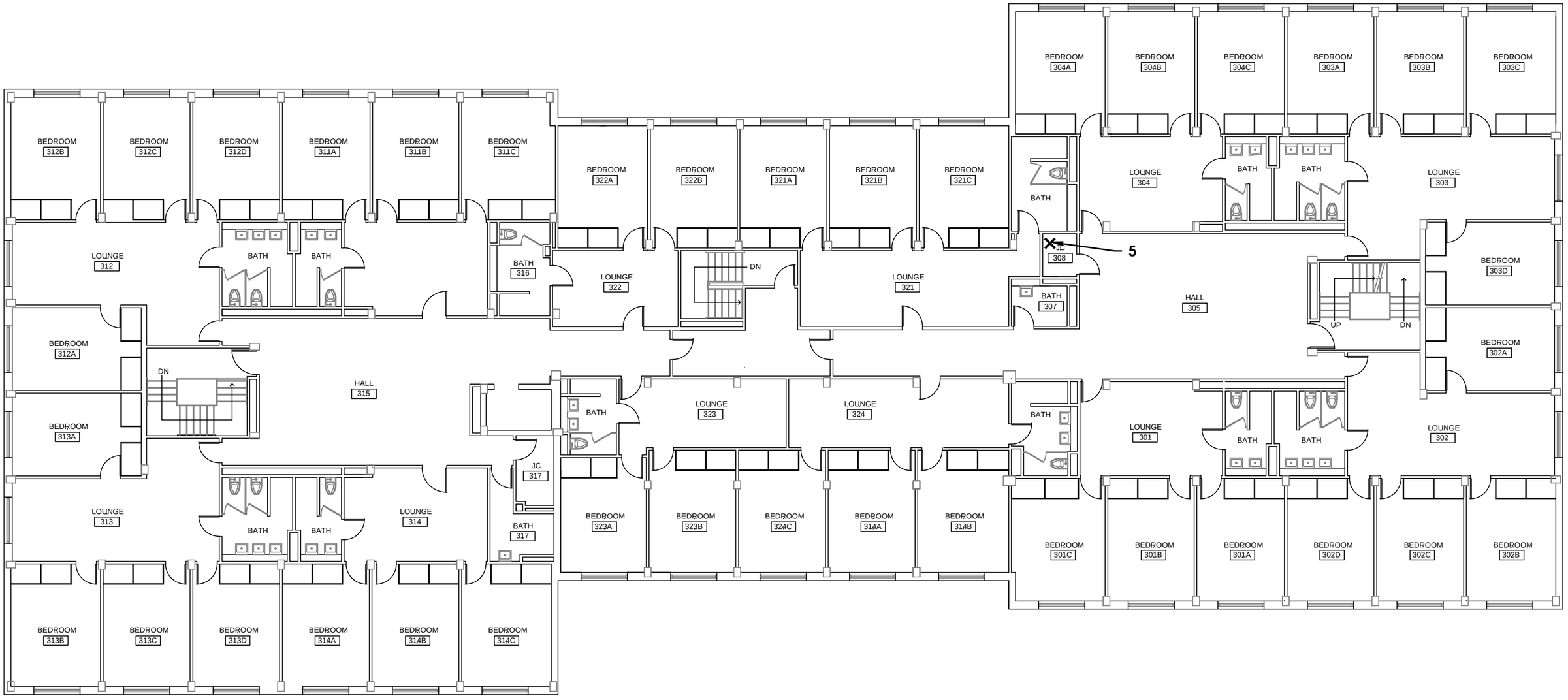
SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171-PCB-**
✕ INDICATES APPROXIMATE SAMPLE LOCATION

PCB SAMPLE LOCATIONS
FIRST FLOOR

WATTS ARCHITECTURE & ENGINEERING, P.C.
95 Perry Street Suite 300
Buffalo, New York 14203
(716) 206-5100 | (716) 206-5199 Fax

DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018



THIRD FLOOR PLAN

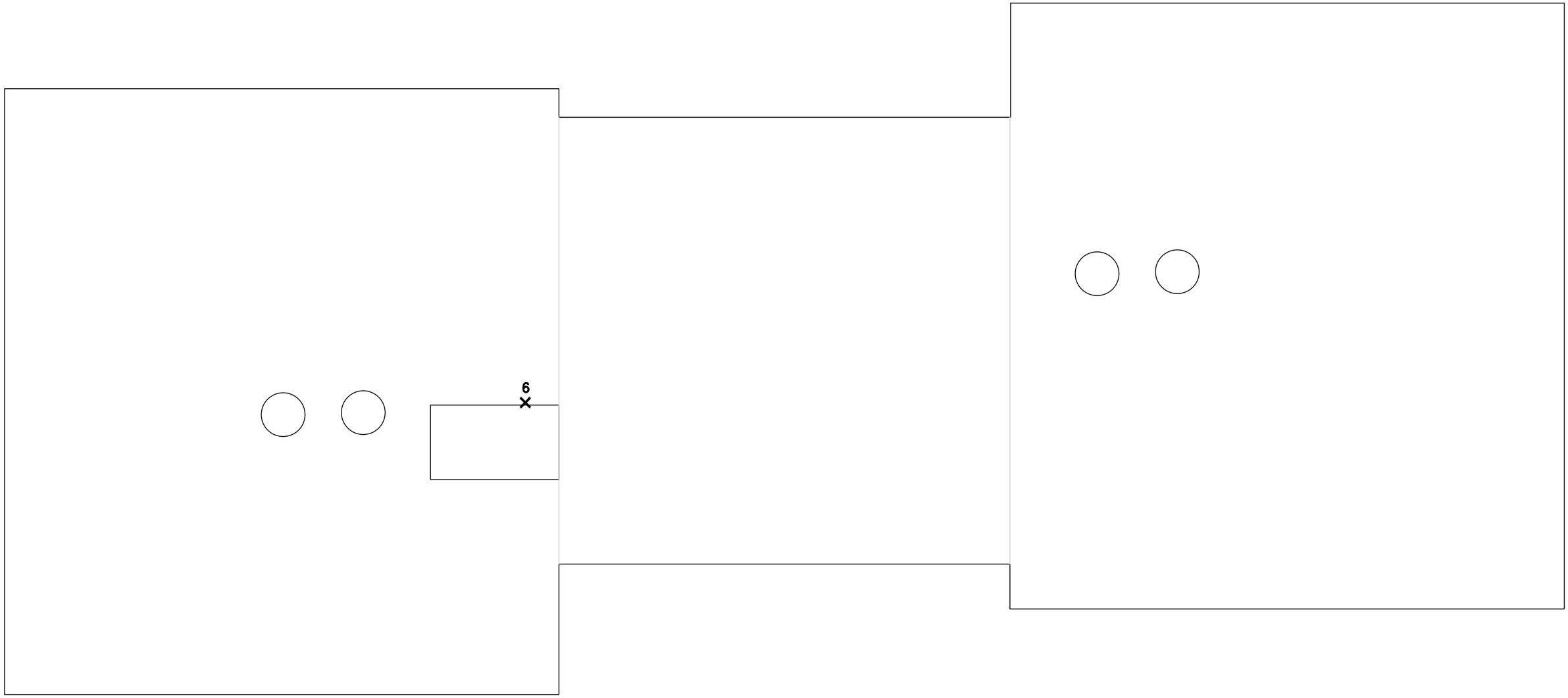
SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171–PCB–**
✕ INDICATES APPROXIMATE SAMPLE LOCATION

PCB SAMPLE LOCATIONS
THIRD FLOOR

WATTS ARCHITECTURE & ENGINEERING, P.C.
95 Perry Street Suite 300
Buffalo, New York 14203
(716) 206-5100 | (716) 206-5199 Fax

DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018



ROOF PLAN

SAMPLES WERE COLLECTED IN JANUARY 2018.
ALL SAMPLE NUMBERS ARE PREFIXED BY **17171–PCB–**
× INDICATES APPROXIMATE SAMPLE LOCATION

PCB SAMPLE LOCATIONS
ROOF

WATTS
ARCHITECTURE
& ENGINEERING
95 Perry Street Suite 300
Buffalo, New York 14203
(716) 206-5100 | (716) 206-5199 Fax

DEYO HALL
SUNY NEW PALTZ
NEW PALTZ, NEW YORK

NOT TO SCALE | MARCH 2018

3.2 – PCB LABORATORY REPORT AND CHAIN-OF-CUSTODY FORMS

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Deyo Hall
Location: Suny New Paltz
Number: 17171

Order #: 244541

Matrix Bulk
Received 01/22/18
Reported 01/25/18

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID	Location / Method	Result	RL*	Units	Analysis Date	Analyst
244541-001	17171-PCB-1	BeigeWindow Caulk					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<367000**	367000	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<367000**	367000	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<367000**	367000	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<367000**	367000	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<367000**	367000	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**2660000**	367000	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<367000**	367000	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<367000**	367000	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<367000**	367000	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					
244541-002	17171-PCB-2	Brown Interior WGC					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<824000**	824000	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<824000**	824000	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<824000**	824000	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<824000**	824000	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<824000**	824000	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**21100000**	824000	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<824000**	824000	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<824000**	824000	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<824000**	824000	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Deyo Hall
Location: Suny New Paltz
Number: 17171

Order #: 244541

Matrix Bulk
Received 01/22/18
Reported 01/25/18

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID	Location / Method	Result	RL*	Units	Analysis Date	Analyst
244541-003	17171-PCB-3	Black Interior WGC					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<803**	803	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<803**	803	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<803**	803	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<803**	803	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<803**	803	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**15400**	803	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<803**	803	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<803**	803	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<803**	803	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					
244541-004	17171-PCB-4	Grey Interior WGC					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<298**	298	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<298**	298	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<298**	298	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<298**	298	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<298**	298	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**2520**	298	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<298**	298	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<298**	298	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<298**	298	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		MI					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Deyo Hall
Location: Suny New Paltz
Number: 17171

Order #: 244541

Matrix Bulk
Received 01/22/18
Reported 01/25/18

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID	Location / Method	Result	RL*	Units	Analysis Date	Analyst
244541-005	17171-PCB-5	White Bathrm Floor					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<181000**	181000	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<181000**	181000	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<181000**	181000	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<181000**	181000	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<181000**	181000	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**<181000**	181000	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<181000**	181000	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<181000**	181000	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**1990000**	181000	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					
244541-006	17171-PCB-6	Reddish/Tan Roof					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<464**	464	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<464**	464	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<464**	464	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<464**	464	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<464**	464	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**1180**	464	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<464**	464	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<464**	464	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<464**	464	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		MI					
TCMX		MI					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Deyo Hall
Location: Suny New Paltz
Number: 17171

Order #: 244541

Matrix Bulk
Received 01/22/18
Reported 01/25/18

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID	Location / Method	Result	RL*	Units	Analysis Date	Analyst
244541-007	17171-PCB-7	White Door Caulk					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<7040**	7040	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<7040**	7040	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<7040**	7040	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<7040**	7040	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<7040**	7040	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**108000**	7040	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<7040**	7040	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<7040**	7040	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<7040**	7040	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					
244541-008	17171-PCB-8	Grey Masonry Cont J C					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<2520000**	2510000	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<2520000**	2510000	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<2520000**	2510000	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<2520000**	2510000	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<2520000**	2510000	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**43700000**	2510000	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<2520000**	2510000	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<2520000**	2510000	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<2520000**	2510000	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Deyo Hall
Location: Suny New Paltz
Number: 17171

Order #: 244541

Matrix Bulk
Received 01/22/18
Reported 01/25/18

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID	Location / Method	Result	RL*	Units	Analysis Date	Analyst
244541-009	17171-PCB-9	Brittle Black Slate Panel					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<2410**	2400	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<2410**	2400	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<2410**	2400	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<2410**	2400	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<2410**	2400	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**9200**	2400	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<2410**	2400	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<2410**	2400	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<2410**	2400	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					
244541-010	17171-PCB-10	Brown Door Caulk					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<1880000**	1870000	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<1880000**	1870000	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<1880000**	1870000	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<1880000**	1870000	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<1880000**	1870000	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**47300000**	1870000	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<1880000**	1870000	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<1880000**	1870000	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<1880000**	1870000	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Deyo Hall
Location: Suny New Paltz
Number: 17171

Order #: 244541

Matrix Bulk
Received 01/22/18
Reported 01/25/18

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID	Location / Method	Result	RL*	Units	Analysis Date	Analyst
244541-011	17171-PCB-11	Brown Masonary Control J					
Semi-volatile Organic Compounds							
Aroclor - 1016		SW846 8082A	**<2190000**	2180000	µg/Kg	01/25/18	AE
Aroclor - 1221		SW846 8082A	**<2190000**	2180000	µg/Kg	01/25/18	AE
Aroclor - 1232		SW846 8082A	**<2190000**	2180000	µg/Kg	01/25/18	AE
Aroclor - 1242		SW846 8082A	**<2190000**	2180000	µg/Kg	01/25/18	AE
Aroclor - 1248		SW846 8082A	**<2190000**	2180000	µg/Kg	01/25/18	AE
Aroclor - 1254		SW846 8082A	**28400000**	2180000	µg/Kg	01/25/18	AE
Aroclor - 1260		SW846 8082A	**<2190000**	2180000	µg/Kg	01/25/18	AE
Aroclor - 1262		SW846 8082A	**<2190000**	2180000	µg/Kg	01/25/18	AE
Aroclor - 1268		SW846 8082A	**<2190000**	2180000	µg/Kg	01/25/18	AE
PCB - Surrogate Recoveries							
DCB		D					
TCMX		D					

244541-01/25/18 04:28 PM

Reviewed By: **Irma Faszewski**
QAQC Director

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

Analysis Report

Schneider Laboratories Global, Inc

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Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Deyo Hall
Location: Suny New Paltz
Number: 17171

Order #: 244541

Matrix Bulk
Received 01/22/18
Reported 01/25/18

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID / Method	Location	Result	RL*	Units	Analysis Date	Analyst

State Certifications

Method	Parameter	New York	Virginia
SW846 8082A	Aroclor - 1016	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1221	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1232	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1242	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1248	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1254	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1260	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1262	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1268	ELAP Certified	VELAP Certified

State	Certificate Number
New York	ELAP 56000
Virginia	VELAP 9017

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

244541 X 11

V:\244\244541

fghraizi 1/22/2018 9:2 3:00 AM

UPS 1Z2E2899846)990548

SCHNEIDER LABORATORIES GLOBAL, INC.

2512 West Cary Street, Richmond, Virginia 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475
www.slabinc.com e-mail: info@slabinc.com

Submitting Co.	Watts Architecture and Engineering	Lab WO#		Phone	716-206-5100
95 Perry Street		Acct #		Fax \ Email	smatthews@watts-ae.com
Buffalo, NY 14203		**State of Collection	NY	**Cert. Required	☐ Yes ☒ No

Project Name: Dreyfoos Hall
Project Location: SUNY New Paltz
Project Number: 17171
Purchase Order #:
TAT Requested (Business Day): ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ 10
All jobs received past 3PM will begin its TAT the next business day

Special Instructions [include requests for special reporting or data packages]

Please report 9 Aroclors - LOQ <50ppm

Analysis Request

BTEX ☐ MTBE ☐ Naphthalene ☐ | Purgeable Aromatics 8021 ☐ | Petrol Hydrocarbons GC 8015M Diesel ☐ 8015M Gas ☐ | TPH 418.1 ☐ | Corrosivity ☐ Reactivity ☐ Flashpoint, Closed Cup ☐ | Volatile Organics 624 ☐ 8260 ☐ | Semivolatile Organics 625 ☐ 8270 ☐ | PAHs 610 ☐ 8270 ☐ 8310 By HPLC ☐ | TCLP Semi-Vols ☐ BNAs ☐ Pest ☐ Herb ☐ VOAs ☐ Fuels ☐ | Pesticides 608 ☐ 8081 ☐ Herbicides 8151 ☐ PCB's 8082 ☒ | Other

Sample #	**Date Sampled	**Time Sampled	# Containers	Lab Use: Chlorine (Cl)	Lab Use: Temp *	Lab Use: pH	Matrix: Drinking Water	Matrix: Waste Water	Matrix: Ground Water	Matrix: Soil / Sludge	Matrix: Wipe	Matrix: Oil or Air	Matrix: Bulk	Analysis Request
17171-PCB-1	1-16-18	1000	1										X	Beige Window Caulk X
-2	1-16-18	10:15	1										X	Brown interior WGC X
-3	1-16-18	10:30	1										X	Black interior WGC X
-4	1-16-18	10:45	1										X	Gray interior WGC X
-5	1-16-18	11:00	1										X	White bathroom floor control joint caulk X
-6	1-16-18	11:30	1										X	Reddish/tan counterflashing caulk (Roof) X
-7	1-16-18	11:45	1										X	White door caulk X
-8	1-16-18	1230	1										X	Grey Masonry control joint caulk X
-9	1-16-18	1300	1										X	Brittle black slate panel caulk X
-10	1-17-18	10:00	1										X	Brown door caulk X
-11	1-17-18	10:30	1										X	Brown Masonry control joint caulk X

All soil and aqueous samples must be sent in adequate quantity for duplicate analysis to be performed per EPA requirements. Failure to perform a sample duplicate analysis, due to a lack of sample quantity, will lead to a disclaimer on the report. All problem jobs without customer response held over 30 days will be voided and disposed of.

Sampled by
NAME Scott Matthews
SIGNATURE S Matthews
DATE / TIME 1-17-18

Relinquished to lab by
NAME Scott Matthews
SIGNATURE S Matthews
DATE / TIME 1-19-18

Preserved ☐ Yes ☐ No ☐ Ambient temp ☐ Ice ☐ R ☐ S ☐ X

☐ Receive a physical copy of report.

Sample Disposal
☐ Return to Sender (Shipping fees)
☐ Disposal by lab
($50 fee for excessive weight)

Shipping Methods
☐ FX ☐ UPS ☐ USM
☐ HD ☐ DB
WB: _____

* Temperature taken with IR Gun A. **Required.

Chain-of-Custody documentation continued internally within lab. Terms and conditions page 2.

4.0 – VISUAL OBSERVATIONS FOR MOLD

40 VISUAL OBSERVATIONS FOR MOLD

Watts was requested to observe (visually) for mold growth within the project limits. For the purpose of describing the size of mold-affected areas, Watts refers to areas as being "Small", Medium", or "Large", as defined in the U.S. EPA document entitled *Mold Remediation in Schools and Commercial Buildings* (September 2008 version).

- A "Small" area is generally considered an area where the total surface area affected is less than ten (10) square feet.
- A "Medium" area is generally considered an area where the total surface area affected is between ten (10) and one hundred (100) square feet.
- A "Large" area is generally considered an area where the total surface area affected is greater than one hundred (100) square feet, or potential for increased occupant or remediator exposure during remediation is estimated to be significant.

During Watts' January, 2018 investigation activities, no visual evidence of mold growth greater than 10 square feet was observed in any single area of the building.

5.0 – LABORATORY ACCREDITATIONS

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2018
Issued April 01, 2017

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

DR. THOMAS R. MCKEE
AMERISCI RICHMOND
13635 GENITO RD
MIDLOTHIAN, VA 23112

NY Lab Id No: 10984

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual

Serial No.: 55872

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

AmeriSci Richmond
dba AmeriSci Richmond
13635 Genito Road
Midlothian, VA 23112
Mr. Thomas B. Keith
Phone: 804-763-1200 Fax: 804-763-1800
Email: bkeith@amerisci.com
http://www.amerisci.com

ASBESTOS FIBER ANALYSIS **NVLAP LAB CODE 101904-0**

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- Appendix E to Subpart E of Part 763 -- Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2018
Issued April 01, 2017

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. FAYEZ ABOUZAKI
SCHNEIDER LABORATORIES GLOBAL, INC
2512 WEST CARY STREET
RICHMOND, VA 23220-5117

NY Lab Id No: 11413

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Characteristic Testing		**Polychlorinated Biphenyls**	
TCLP	EPA 1311	PCB-1268	EPA 8082A
Metals I		**Sample Preparation Methods**	
Barium, Total	EPA 6010C		EPA 3010A
Cadmium, Total	EPA 6010C		EPA 3050B
Chromium, Total	EPA 6010C		EPA 3550C
Lead, Total	EPA 6010C		EPA 3031
	EPA 7000B		
Nickel, Total	EPA 6010C		
Silver, Total	EPA 6010C		
Metals II			
Antimony, Total	EPA 6010C		
Arsenic, Total	EPA 6010C		
Chromium VI	EPA 7196A		
Mercury, Total	EPA 7471B		
Selenium, Total	EPA 6010C		
Polychlorinated Biphenyls			
PCB-1016	EPA 8082A		
PCB-1221	EPA 8082A		
PCB-1232	EPA 8082A		
PCB-1242	EPA 8082A		
PCB-1248	EPA 8082A		
PCB-1254	EPA 8082A		
PCB-1260	EPA 8082A		
PCB-1262	EPA 8082A		

Serial No.: 56000

6.0 – CONSULTANT'S LICENSES AND CERTIFICATIONS

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

44 W 28th Street, 5th Floor
New York, NY 10001

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Watts Architecture & Engineering, D.P.C.
Suite 300
95 Perry Street

Buffalo, NY 14203

FILE NUMBER: 12-68007
LICENSE NUMBER: 68007
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 08/24/2017
EXPIRATION DATE: 09/30/2018

Duly Authorized Representative – Edward Watts:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

120 E. Washington St., Suite 414
Syracuse, NY 13202

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Buffalo, NY 14203

44 W 28th Street, 5th Floor
New York, NY 10001

NEW YORK STATE - DEPARTMENT OF LABOR
DIVISION OF SAFETY AND HEALTH
LICENSE AND CERTIFICATE UNIT
STATE CAMPUS BUILDING 12

Mold Assessor Company License

Watts Architecture + Engineering, D.P.C.
d\b\a\: Edward O. Watts
95 Perry St, Suite 300
BUFFALO, NY 14203

LICENSE NUMBER 00127
DATE OF ISSUE: 1/4/2018
EXPIRATION DATE 12/31/2019

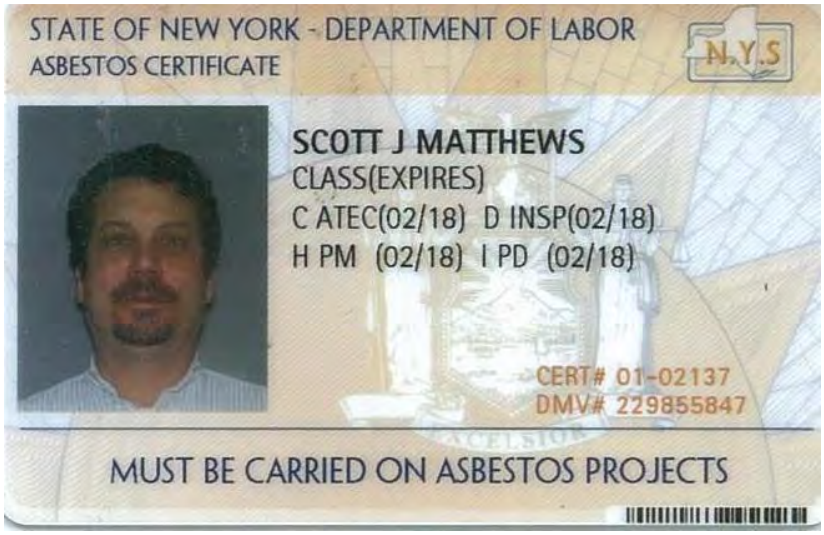
This license is valid only for the contractor named above.

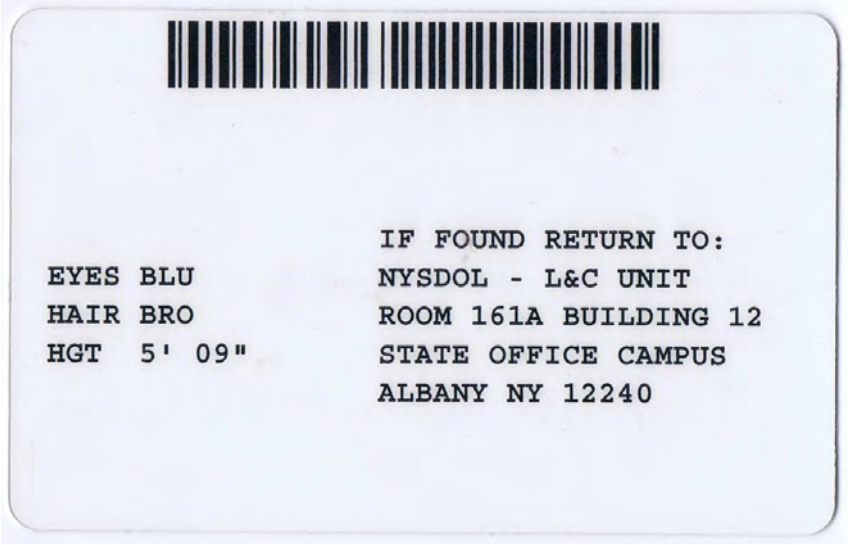
Eileen Franko, Director
FOR THE COMMISSIONER OF LABOR

WATTS
ARCHITECTURE &
ENGINEERING

95 Perry Street Suite 300
Buffalo, New York 14203

120 East Washington Street, Suite 414
Syracuse, New York 13202





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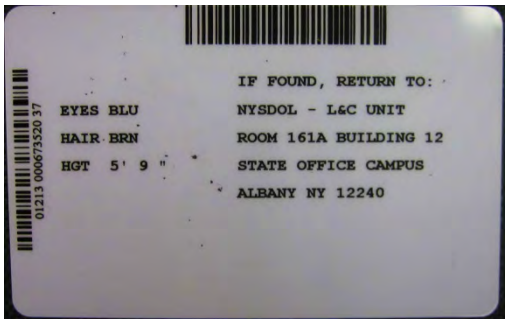
44 W 28th Street, 5th Floor
New York, NY 10001



APPENDIX B

GEOTECHNICAL EVALUATION
SUNY NEW PALTZ BEVIER HALL
4 HAWK DRIVE
NEW PALTZ, NEW YORK

PREPARED FOR:

ARCHITECTURE+
297 RIVER STREET
TROY, NY 12180

PREPARED BY:

TECTONIC ENGINEERING & SURVEYING CONSULTANTS P.C.
1279 ROUTE 300
NEWBURGH, NEW YORK 12550
(P) 845.567.6656
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AUGUST 28, 2014

MARK A. STIER, P.E. NO. 076154

TECTONIC

Practical Solutions, Exceptional Service

W.O. 7211.02

GEOTECHNICAL EVALUATION
SUNY NEW PALTZ BEVIER HALL
4 HAWK DRIVE
NEW PALTZ, NEW YORK

TABLE OF CONTENTS

1.0 INTRODUCTION

In accordance with your request, a subsurface investigation and appropriate geotechnical engineering analyses were performed for the proposed dormitory building at the State University of New York (SUNY) campus located in New Paltz, New York. The purpose of our study was to evaluate the subsurface conditions and to determine if the existing subsurface conditions below the foundations for the existing three story dormitory can support the additional loads from a vertical expansion of the building. Additionally, Tectonic also performed a supplemental subsurface investigation at the proposed elevator location at Dubois Hall, and Deyo Hall to evaluate if rock was present at these locations. This report presents our findings and recommendations regarding the subsurface conditions and foundation design.

2.0 SCOPE OF SERVICES

The following scope of services was performed for Architecture +, herein referred to as Client:

- Review of readily available background materials including geologic maps, published literature, in-house information, and plans that were provided by the Client.
- Drilling, sampling, and logging of three (3) test borings around Bevier Hall. The borings were drilled to depths ranging from approximately 10.5 to 18 feet.
- Coring of the floor slab and sampling subslab soils using hand driven split spoons at the location of the proposed elevator in Bevier Hall, Deyo Hall, and Dubois Hall. The sampling was advanced to depths ranging from approximately 4.5 feet to 6.5 feet.
- Laboratory testing of select soil samples to confirm field identification of the soils and assist in identifying the engineering characteristics of the soils.
- Geotechnical engineering evaluation of the subsurface conditions and laboratory test results as they relate to the design and construction of the vertical additions for each building.
- Preparation of this geotechnical report presenting the results of the performed investigation, laboratory testing, engineering analyses, as well as the conclusions and geotechnical recommendations for design and construction of additions to the structures.

3.0 SITE AND PROJECT DESCIPTIONS

The project site is located on the SUNY campus in New Paltz, New York. The proposed improvements consist of the addition of a partial fourth floor to Bevier Hall, which is an existing three-story dormitory structure. Additionally new elevators are proposed for Bevier Hall, as well as Deyo Hall and Dubois Hall.

Based on our discussions with the client and review of plans provided by the client, we understand that the existing buildings in the Hasbrouck quad were completed in the late 1960's and are reportedly supported on a shallow foundation system. The proposed improvements to Bevier Hall include construction of an additional partially occupied floor on the building with a new peaked roof. Construction will include installation of a new elevator. The existing building is currently three stories with no basement. The south end of the lowest level of the building is partially embedded into the sloping ground. The project structural engineer has estimated that the proposed vertical addition to the building will result in an increased load of 10 to 15 percent over the existing loading. Review of the design plans for the buildings indicate the footings were designed to bear on soil or rock capable of supporting 4,000 pounds per square foot. Due to the possibility of shallow rock under the floor slab, the structural engineer and architect were concerned that bedrock might impact excavation of the new elevator pit.

FULL BASEMENT?

Deyo Hall and Dubois Hall are also slated for improvements as discussed in Tectonic's geotechnical report, dated May 29, 2014 and revised July 23, 2014. A new elevator is proposed in each of these structures as part of the improvements. A supplemental investigation was deemed appropriate to determine if the proposed elevator pits would be impacted by bedrock.

The dormitory buildings are located in the southeast corner of the campus. To the south lies the campus road "Southside Loop". Bevier Hall is bordered on the west by a tennis court and Deyo Hall, and to the north by Hasbrouck Dining Hall. Bevier Hall is part of a cluster of five dormitories that surround a student dining hall. Topographically, the area surrounding the existing dorm building slopes gently from elevation of 360 feet near NYS Route 32 on the east down an elevation of approximately 318 feet at the pond located just west of the cluster of dorm buildings.

4.0 SUBSURFACE INVESTIGATION

The subsurface investigation consisted of three borings, designated as B-1 through B-3 and three (3) slab cores, designated as C-1 through C-3. Prior to the start of the subsurface investigation, Tectonic retained a private utility locator to clear each of the proposed boring locations. Borings B-1 was performed at the north end of the east side of Bevier Hall. Boring B-2 was performed on the west side of Bevier Hall and boring B-3 was performed at the south end of Bevier Hall. The slab cores were performed in the ground floor janitor supply rooms of Bevier

Hall, Deyo Hall and Dubois Hall. Slab core C-1 was performed in Bevier Hall, slab core C-2 was performed in Dubois Hall and slab core C-3 was performed in Deyo Hall. The boring locations are shown on the attached Boring and Core Location Plan, Figure 1. The slab core locations are shown on the attached Slab Core Location Plan, Figure 2.

The borings were performed by General Borings, Inc. on August 19, 2014 utilizing an ATV-mounted drill rig. Boring B-1 was advanced to a depth of 13 feet using hollow stem augers and then cored 5 feet into rock with a double barrel core bit. Borings B-2 and B-3 were advanced by hollow stem auger to auger refusal at depths of 10.5 feet and 14 feet respectively. Standard Penetration Testing (SPT) and split-spoon sampling was performed continuously from 0 feet to 12 feet, and then at 5-foot intervals at greater depths. Groundwater observation wells were not installed in the borings but infiltration of groundwater was noted at a depth of 6 feet below ground surface in boring B-1.

The slab cores were cored using a portable electric core drill with a 4 inch bit. The soils below the slab were sampled using a spilt spoon sampler that was advanced using a 75 pound manual slide hammer. The spilt spoons were advanced every 2 feet. After completion of the sampling, the cuttings were placed in the hole and the slab was patched with concrete to match the grade of the existing floor.

All work was observed on a full-time basis by a geotechnical engineer under the purview of a New York State licensed Professional Engineer. The geotechnical engineer also collected samples for laboratory testing and prepared logs of the encountered subsurface conditions. Copies of the logs are included in Appendix I.

5.0 LABORATORY TESTING

Laboratory testing was performed on selected soil samples to assist in evaluating the engineering properties of the soil and to confirm field identification of the soils. Testing included the performance of two (2) gradation analyses in accordance with ASTM Standard D422. The results of the laboratory testing are included in Appendix II and discussed in Section 6 of this report.

6.0 SUBSURFACE CONDITIONS

The results of our subsurface investigation indicate that the site is underlain by native soils and bedrock. Topsoil was encountered within the upper several inches at the boring locations performed in landscaped areas. Generalized descriptions of the materials encountered are given below. More detailed descriptions are provided in the boring logs included in Appendix I.

6.1 Native Soils/Reworked Native Soils

Native soils and/or reworked native soils were encountered underlying the existing topsoil materials in all borings. The native soils are glacial deposits, predominately consisting of a brown coarse to fine sand with varying amounts of silt and gravel. The native soil typically ranges from medium dense to very dense, as indicated by SPT N-values ranging from 10 to over 50 blows per foot (bpf). The soils below the slab at the proposed elevator locations had a similar composition. Although the hand advanced cannot be directly correlated to SPT blow counts, the soils appeared to become more dense with depth below the slab. It is likely that the upper layers of soil were reworked native soils from the construction and associated backfilling of the structures.

6.2 Bedrock

Bedrock was encountered underlying the native soils in all of the borings. The bedrock was observed to consist of gray, fine-grained, moderately weathered, moderately fractured, medium hard shale. The rock quality designation (RQD) in the core from B-1 was 29 percent.

The depth to bedrock was found to vary from as shallow as 10.5 feet below the ground surface in boring B-2, to as deep as 14 feet in B-3. Based on experience at other locations on campus, the bedrock surface can be highly variable over short distances due to the steep dip of the bedrock bedding planes.

6.3 Groundwater

An attempt was made to measure groundwater levels at the completion of drilling each boring. Groundwater was encountered in all of the borings at the time of drilling at depths of approximately 5 feet to 8.5 feet below ground surface. Groundwater was measured at 6 feet below grade at boring B-1. Samples from boring B-2 indicate

saturated soils at an approximate elevation of 5 feet below grade. Samples from boring B-3 indicate groundwater at an approximate elevation of 8.5 feet below grade. It should be noted that groundwater levels fluctuate with rainfall and seasonal weather conditions and that the testing performed for this project was done during a period of low rainfall conditions. Zones of perched water at the bedrock surface and at higher elevations should also be expected following periods of rainfall and in the spring.

6.4 Slab Cores

The floor slab at the three proposed elevator locations consisted of painted concrete slabs-on-grade floors. The slab was approximately 4 inches thick at all three locations. Wire mesh was observed in the core from Bevier Hall C-1. The slab core sampling at Bevier Hall and at Dubois Hall did not encounter bedrock at depth of 6.3 feet below the top of the floor slab. The slab core sampling at Deyo Hall encountered either bedrock or a boulder at 4.85 feet and could not be advanced any deeper.

Please note that the private utility locator noted what appeared to be rebar spanning from the north to south walls near the western side of the proposed elevator in Dubois Hall that may be consistent with a grade beam. This rebar signature was not observed under the floor slabs at Bevier Hall or Deyo Hall.

7.0 DISCUSSION AND CONCLUSIONS

The main geotechnical issue affecting the project is the effect of the additional proposed loading on the existing soil/foundation system. The main geotechnical design concern is whether the existing soils can support the increased bearing pressure. The existing footings were designed for bearing pressures of 4,000 pounds per square foot (psf). The soils were generally observed in a medium dense condition to very dense condition. After reviewing the construction plans, it is Tectonic's opinion that the footings bear primarily on the native glacial soils, although some footings could bear on bedrock. Assuming that the footings bear on the native denser glacial soils, the existing subgrade soil should be capable of an allowable bearing capacity of 5,000 psf. The existing bedrock is capable of providing a bearing capacity of over 6,000 pounds per square foot (psf).

A second geotechnical design concern is the magnitude of settlement that may occur due to the increased loading. Based on the soil borings, Tectonic anticipates that most of the footings in Bevier Hall are bearing on native soils. The anticipated total settlement from the additional loading is on the order of ¼ to ½ inch. As the subsurface soils are very similar across the site, the amount of differential settlement is anticipated to be approximately one half of the total settlement on the building.

7.1 Foundation Walls

Any proposed below-grade foundation walls should be designed using the following criteria:

Soil Parameter	Structural Fill / Native Soils
Angle of internal Friction	32º
Active earth pressure (1) Coefficient (Ka)	0.31
Passive earth pressure(2) Coefficient (Kp)	3.25
At rest earth pressure(3) Coefficient (Ko) (restrained wall)	0.47
Coefficient of base(4) Friction	0.42
Total unit weight of soil (pounds per cubic foot)	125

1) Use for freestanding walls where movement of up to 0.0025 X height of wall is both possible and tolerable. Otherwise, use at-rest coefficient.

2) Passive resistance should be neglected within the zone of frost penetration (4 feet).

3) Use for walls restrained against outward lateral movement including basements walls.

4) Coefficient of base friction applies to mass concrete placed directly against the native materials or structural fill.

Additional loading due to temporary and permanent surcharges should be added to the lateral loading exerted by the backfill.

Walls should be backfilled by structural fill conforming to typical DASNY specifications. Structural fill should generally be placed in uniform horizontal lifts not exceeding 8 inches in loose thickness when using a 10-ton roller. In confined areas, the loose lift thickness should be 4 inches or less and each lift should be compacted with sufficient passes of hand operated vibratory or impact compaction equipment. Placement and compaction of backfill should be observed and tested by a geotechnical engineer to monitor that proper compaction is being achieved.

Damp proofing should be provided for all foundation walls where the outside grade is higher than the slab elevation. For all foundation walls where the top of slab is constructed at a lower elevation than the outside grade of the bottom level of the buildings, the walls should be designed to resist hydrostatic pressures assuming a design groundwater elevation of 335 feet and be constructed with a waterproofing membrane such as Grace Preprufe 300R or equivalent. Grading of the surface of the backfill and surrounding topography and pavements should provide positive drainage away from the walls. Roof drains should be positively drained to areas away from the building.

8.0 LIMITATIONS

Our professional services have been performed using that degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical engineers and geologists practicing in this or similar situations. The interpretation of the field data is based on good judgment and experience. However, no matter how qualified the geotechnical engineer or detailed the investigation, subsurface conditions cannot always be predicted beyond the points of actual sampling and testing. No other warranty, expressed or implied, is made as to the professional advice included in this report.

The recommendations contained in this report are intended for design purposes only. Contractors and others involved in the construction of this project are advised to make an independent assessment of the rock, subsoil and groundwater conditions for the purpose of establishing quantities, schedules and construction techniques.

This report has been prepared for the exclusive use of Architecture +, for the specific application to the proposed construction detailed in this report. We recommend that prior to construction; Tectonic Engineering & Surveying Consultants P.C. (Tectonic) reviews the project plans and specifications. It should be noted that upon review of those documents, some recommendations presented herein might be revised or modified. In the event that any changes in the design of the proposed additions are planned, Tectonic shall not consider the conclusions and recommendations contained in this report valid unless reviewed and verified in writing. It is further recommended that Tectonic be retained to provide construction monitoring and inspection services to ensure proper implementation of the recommendations contained herein, which would otherwise limit our professional liability.

FIGURE I

LEGEND

B–1 APPROXIMATE BORING LOCATION

C–1 APPROXIMATE SLAB CORE LOCATION

NOTES

1. PLAN BASED ON DRAWING ENTITLED "X–PL–SURVEY–HASBROUCK.DWG", PROVIDED BY ARCHITECTURE + ON 4–28–14.
2. BORINGS WERE LOCATED BY FIELD MEASURING OFF EXISTING SITE FEATURES AND SHOULD BE CONSIDERED APPROXIMATE.

0 1 2 3

ORIGINAL SIZE IN INCHES

TECTONIC
• PLANNING
• ENGINEERING
• SURVEYING
• CONSTRUCTION MANAGEMENT

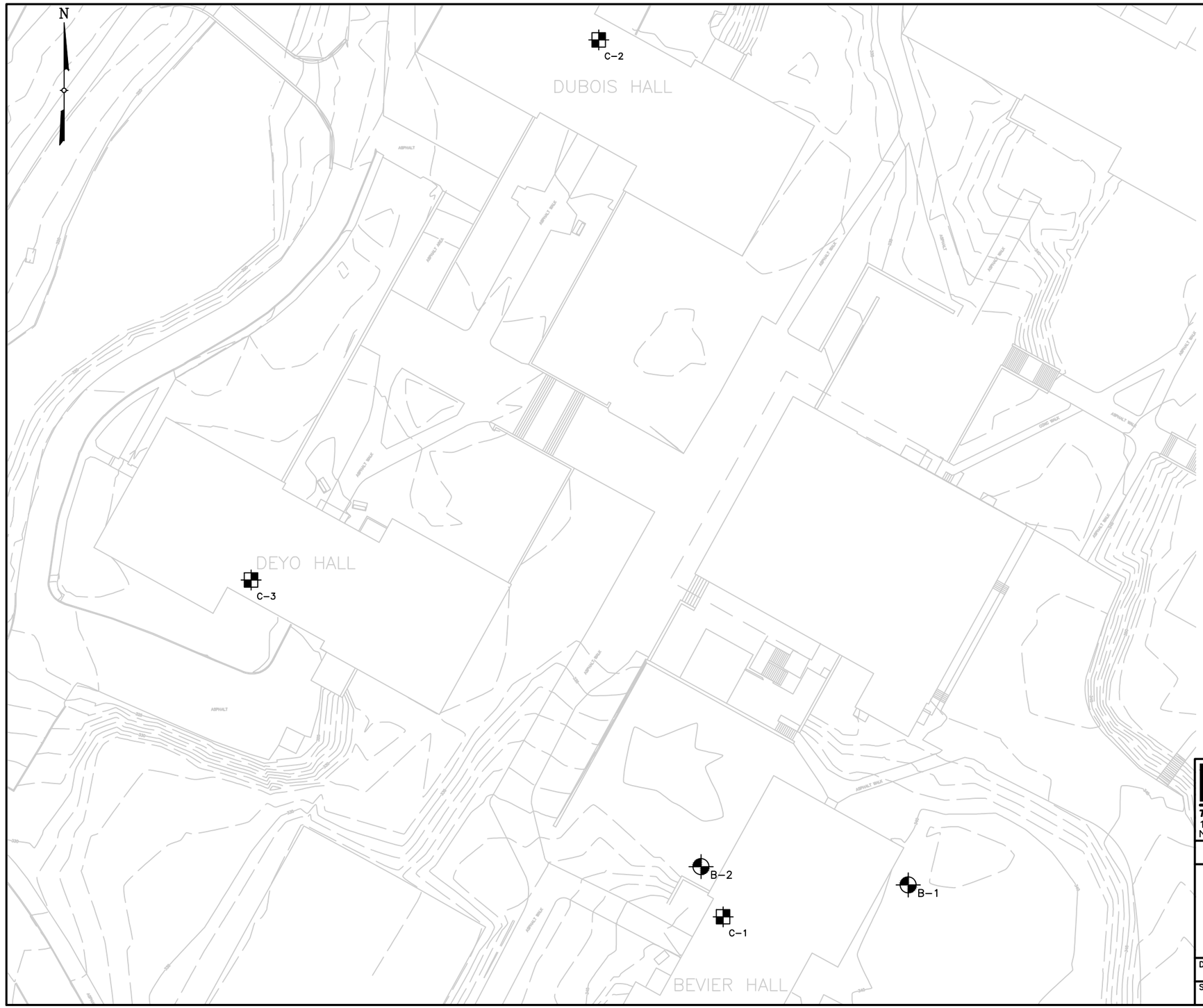
TECTONIC Engineering & Surveying Consultants P.C.
1279 Route 300
Newburgh, NY 12550
Phone: (845) 534–5959
Fax: (845) 567–6248
www.tectonicengineering.com

BORING AND CORE LOCATION PLAN - BEVIER HALL

SUNY NEW PALTZ
4 HAWKS DRIVE
NEW PALTZ
NEW YORK 12561

Date	Work Order	Drawing No.	Rev
8/26/2014	7211.02	FIGURE 1	0
Scale 1"–30'			

FIGURE II



LEGEND

B-1 APPROXIMATE BORING LOCATION

C-1 APPROXIMATE SLAB CORE LOCATION

NOTES

1. PLAN BASED ON DRAWING ENTITLED "X-PL-SURVEY-HASBROUCK.DWG", PROVIDED BY ARCHITECTURE + ON 4-28-14.
2. BORINGS WERE LOCATED BY FIELD MEASURING OFF EXISTING SITE FEATURES AND SHOULD BE CONSIDERED APPROXIMATE.

0 1 2 3

ORIGINAL SIZE IN INCHES

TECTONIC
- PLANNING
- ENGINEERING
- SURVEYING
- CONSTRUCTION MANAGEMENT

TECTONIC Engineering & Surveying Consultants P.C.
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Newburgh, NY 12550
Phone: (845) 534-5959
Fax: (845) 567-6248
www.tectonicengineering.com

SLAB CORE LOCATION PLAN

SUNY NEW PALTZ
4 HAWKS DRIVE
NEW PALTZ
NEW YORK 12561

Date	Work Order	Drawing No.	Rev
8/26/2014	7211.02	FIGURE 2	0
Scale 1"=50'			

APPENDIX I

TECTONIC *ENGINEERING & SURVEYING CONSULTANTS P.C.*

PROJECT No. **7211.02**

PROJECT: **SUNY New Paltz Vertical Expansion Bevier Hall**

LOCATION: **New Paltz, NY**

BORING No. B-1

SHEET No. 1 of 1

CLIENT: **Architecture+**

CONTRACTOR: **General Borings, Inc.**

METHOD OF ADVANCING BORING	DIA.	DEPTH
POWER AUGER:	**3 7/8"**	**0** TO **13'**
ROT. DRILL:		TO
CASING:		TO
DIAMOND CORE:	**NX**	**13** TO **18'**

Case 580E Safety Hammer

GROUND WATER	DATE	TIME	DEPTH
	8/19/14	**9:30 am**	**6'**

MON. WELL ☐ YES ☒ NO

SCREEN DEPTH: **---** TO **---**

WEATHER: **Clear** TEMP: **65° F**

DEPTH TO ROCK: **13'**

*CHANGES IN STRATA ARE INFERRED

INSPECTOR: **Scott Cohen**

DRILLER: **Bob**

SURFACE ELEVATION: **339.5**

DATUM: **See Remarks**

DATE START: **8/19/14**

DATE FINISH: **8/19/14**

UNCONFINED COMPRESS. STRENGTH (TONS/FT) ● 1 2 3 4 5

PLASTIC LIMIT % ✕ WATER CONTENT % ⊗ LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION (BLOWS/FT.) ● 10 20 30 40 50

DEPTH (FT.)	N OR MIN./FT.	PENETRATION RESISTANCE (BL/6 IN.)	SAMPLES: SAMPLE NUMBER	RECOV.: LENGTH (IN.)	RECOV.: RQD (%)	MOISTURE	UNIFIED SOIL CLASS.	DESCRIPTION OF MATERIAL	LITHOLOGY*	ELEVATION (FT.)
1	48	16 24 24 26	S-1	13		D		Bwn-gy c-f SAND, some Silt, some c-f Gravel (FILL)		
3	32	26 19 13 8	S-2	10		D	SP	Bwn-tn m-f SAND, and c-f Gravel		
5	61	11 27 34 37	S-3	18		M	GM	Bwn-gy GRAVEL, some Silt, little c-f Sand		334.5
6	50+	46 50/3	S-4	9		W	SM	Same		
8	50+	50/2	S-5	2		W		Gy-blk c-f SAND, trace c-f Gravel (decomposed SHALE)		
10										329.5
13								Auger refusal @ 13'		
14	3.5									
15	4							Gy, moderately weathered, moderately fractured, fine grained, SHALE, with bedding oriented approximately 45 degrees to horizontal		324.5
16	4		C-1	53/60	29.2					
17	8									
18	4									
18								End of Boring at 18'		
20										319.5
25										314.5

REMARKS:

BORING LOG 7211.02.GPJ TECTONIC ENG.GDT 8/28/14

TECTONIC *ENGINEERING & SURVEYING CONSULTANTS P.C.*

PROJECT No. **7211.02**

PROJECT: **SUNY New Paltz Vertical Expansion Bevier Hall**

LOCATION: **New Paltz, NY**

BORING No. B-2

SHEET No. 1 of 1

CLIENT: **Architecture+**

CONTRACTOR: **General Borings, Inc.**

METHOD OF ADVANCING BORING | DIA. | DEPTH

POWER AUGER: | **3 7/8"** | **0** TO **10.5'**

ROT. DRILL: | | TO

CASING: | | TO

DIAMOND CORE: | | TO

Case 580E Safety Hammer

GROUND WATER	DATE	TIME	DEPTH
	8/19/14		**5'**

MON. WELL ☐ YES ☒ NO

SCREEN DEPTH: **---** TO **---**

WEATHER: **Clear** TEMP: **73° F**

DEPTH TO ROCK: **10.5'**

*CHANGES IN STRATA ARE INFERRED

INSPECTOR: **Scott Cohen**

DRILLER: **Bob**

SURFACE ELEVATION: **340.5**

DATUM: **See Remarks**

DATE START: **8/19/14**

DATE FINISH: **8/19/14**

UNCONFINED COMPRESS. STRENGTH (TONS/FT) ● 1 2 3 4 5

PLASTIC LIMIT % ✕ WATER CONTENT % ⊗ LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION (BLOWS/FT.) ● 10 20 30 40 50

DEPTH (FT.)	N OR MIN./FT.	PENETRATION RESISTANCE (BL/6 IN.)	SAMPLES: SAMPLE NUMBER	RECOV.: LENGTH (IN.)	RECOV.: RQD (%)	MOISTURE	UNIFIED SOIL CLASS.	DESCRIPTION OF MATERIAL	LITHOLOGY*	ELEVATION (FT.)
1	65	10 27 38 29	S-1	16		D		Bwn-tn c-f SAND, some c-f Gravel, some Silt (FILL)		65
2										
3	80+	48 30 50/4	S-2	6		D	SM	Bwn-tn m-f SAND, and Silt, little c-f Gravel		80
4										
5								▼		335.5
6	10	9 5 5 6	S-3	3		W	SP	Bwn c-f SAND, trace Silt, and f Gravel		
7										
8	10	2 3 7 27	S-4	6		W	SM	Gy-blk c-f SAND, little Silt, trace f Gravel (decomposed SHALE)		
9										
10								Auger refusal @ 10.5'		330.5
11								End of Boring at 10.5'		
12										
13										
14										
15										325.5
16										
17										
18										
19										
20										320.5
21										
22										
23										
24										
25										315.5

REMARKS:

BORING LOG 7211.02.GPJ TECTONIC ENG.GDT 8/28/14

TECTONIC *ENGINEERING & SURVEYING CONSULTANTS P.C.*

PROJECT No. **7211.02**

PROJECT: **SUNY New Paltz Vertical Expansion Bevier Hall**

LOCATION: **New Paltz, NY**

BORING No. B-3

SHEET No. 1 of 1

CLIENT: **Architecture+**

CONTRACTOR: **General Borings, Inc.**

METHOD OF ADVANCING BORING	DIA.	DEPTH
POWER AUGER:	**3 7/8"**	**0** TO **14'**
ROT. DRILL:		TO
CASING:		TO
DIAMOND CORE:		TO

Case 580E Safety Hammer

GROUND WATER	DATE	TIME	DEPTH
	8/26/14	**1:30 pm**	**8.5'**

MON. WELL ☐ YES ☒ NO

SCREEN DEPTH: **---** TO **---**

WEATHER: **Clear** TEMP: **75° F**

DEPTH TO ROCK: **14'**

*CHANGES IN STRATA ARE INFERRED

INSPECTOR: **Scott Cohen**

DRILLER: **Bob**

SURFACE ELEVATION: **346.0**

DATUM: **See Remarks**

DATE START: **8/19/14**

DATE FINISH: **8/19/14**

UNCONFINED COMPRESS. STRENGTH (TONS/FT) ● 1 2 3 4 5

PLASTIC LIMIT % ✕ WATER CONTENT % ⊗ LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION (BLOWS/FT.) ● 10 20 30 40 50

DEPTH (FT.)	N OR MIN./FT.	PENETRATION RESISTANCE (BL/6 IN.)	SAMPLES: SAMPLE NUMBER	RECOV.: LENGTH (IN.)	RECOV.: RQD (%)	MOISTURE	UNIFIED SOIL CLASS.	DESCRIPTION OF MATERIAL	LITHOLOGY*	ELEVATION (FT.)
1	13	5 7 6 6	S-1	15		D		Bwn-tn m-f SAND, and Silt, little f Gravel (FILL)		
3	15	5 7 8 9	S-2	8		M		Dk bwn m-f SAND, some Silt, little c-f Gravel (FILL)		
5	25	7 9 16 26	S-3	20		M	SM	Bwn m-f SAND, and Silt, little f Gravel		341.0
7	50	26 25 25 30	S-4	14		M	SM	Same		
9	32	16 16 16 15	S-5	12		W	SM	Bwn-gy m-f SAND, some Silt, some c-f Gravel		336.0
14								Auger refusal @ 14'		
15								End of Boring at 14'		331.0
20										326.0
25										321.0

REMARKS:

BORING LOG 7211.02.GPJ TECTONIC ENG.GDT 8/28/14

TECTONIC *ENGINEERING & SURVEYING CONSULTANTS P.C.*

PROJECT No. **7211.02**

PROJECT: **SUNY New Paltz Vertical Expansion Bevier Hall**

LOCATION: **New Paltz, NY**

BORING No. C-1

SHEET No. 1 of 1

CLIENT: **Architecture+**

CONTRACTOR: **General Borings, Inc.**

METHOD OF ADVANCING BORING | DIA. | DEPTH

POWER AUGER: | | TO

ROT. DRILL: | | TO

CASING: | | TO

DIAMOND CORE: | | TO

Continuous Hand Driven Split Spoon

GROUND WATER | DATE | TIME | DEPTH

MON. WELL ☐ YES ☒ NO

SCREEN DEPTH: --- TO ---

WEATHER: **Clear** TEMP: **75° F**

DEPTH TO ROCK: **Not Encountered'**

*CHANGES IN STRATA ARE INFERRED

INSPECTOR: **Scott Cohen**

DRILLER: **Jim Casson**

SURFACE ELEVATION: **341.3**

DATUM: **See Remarks**

DATE START: **8/19/14**

DATE FINISH: **8/19/14**

UNCONFINED COMPRESS. STRENGTH (TONS/FT) ● 1 2 3 4 5

PLASTIC LIMIT % ✕ WATER CONTENT % ⊗ LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION (BLOWS/FT.) ● 10 20 30 40 50

DEPTH (FT.)	N OR MIN./FT.	PENETRATION RESISTANCE (BL/6 IN.)	SAMPLES: SAMPLE NUMBER	RECOV.: LENGTH (IN.)	RECOV.: RQD (%)	MOISTURE	UNIFIED SOIL CLASS.	DESCRIPTION OF MATERIAL	LITHOLOGY*	ELEVATION (FT.)
0								4" Concrete slab		
1–2			S-1	18		D		Dk bwn m-f SAND, some c-f Gravel, some Silt (FILL)		
3–4			S-2	16		M	SM	Dk bwn m-f SAND, and Silt, little c-f Gravel		
5–6			S-3	12		M	SM	Same		336.3
7								End of Boring at 6.33'		
10										331.3
15										326.3
20										321.3
25										316.3

REMARKS: Ground floor janitor supply room Bevier Hall.

BORING LOG 7211.02.GPJ TECTONIC ENG.GDT 8/28/14

TECTONIC *ENGINEERING & SURVEYING CONSULTANTS P.C.*

PROJECT No. **7211.02**

PROJECT: **SUNY New Paltz Vertical Expansion Bevier Hall**

LOCATION: **New Paltz, NY**

BORING No. C-2

SHEET No. 1 of 1

CLIENT: **Architecture+**

CONTRACTOR: **General Borings, Inc.**

METHOD OF ADVANCING BORING | DIA. | DEPTH

POWER AUGER: | | TO

ROT. DRILL: | | TO

CASING: | | TO

DIAMOND CORE: | | TO

Continuous Hand Driven Split Spoon

GROUND WATER | DATE | TIME | DEPTH

MON. WELL ☐ YES ☒ NO

SCREEN DEPTH: --- TO ---

WEATHER: **Clear** TEMP: **75° F**

DEPTH TO ROCK: **Not Encountered'**

*CHANGES IN STRATA ARE INFERRED

INSPECTOR: **Scott Cohen**

DRILLER: **Jim Casson**

SURFACE ELEVATION: **325.1**

DATUM: **See Remarks**

DATE START: **8/19/14**

DATE FINISH: **8/19/14**

UNCONFINED COMPRESS. STRENGTH (TONS/FT) ● 1 2 3 4 5

PLASTIC LIMIT % ✕ WATER CONTENT % ⊗ LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION (BLOWS/FT.) ● 10 20 30 40 50

DEPTH (FT.)	N OR MIN./FT.	PENETRATION RESISTANCE (BL/6 IN.)	SAMPLES: SAMPLE NUMBER	RECOV.: LENGTH (IN.)	RECOV.: RQD (%)	MOISTURE	UNIFIED SOIL CLASS.	DESCRIPTION OF MATERIAL	LITHOLOGY*	ELEVATION (FT.)
								4" Concrete		
1–2			S-1	14		D	SM	Dk bwn m-f SAND, and Silt, little c-f Gravel		
3–4			S-2	10		M	SM	Bwn m-f SAND, some Silt, some c-f Gravel		
5–6			S-3	12		M	SM	Dk bwn m-f SAND, and Silt, little c-f Gravel		320.1
7–25								End of Boring at 6.33'		315.1 / 310.1 / 305.1 / 300.1

REMARKS: Ground floor janitor supply room Dubols Hall.

BORING LOG 7211.02.GPJ TECTONIC ENG.GDT 8/28/14

TECTONIC *ENGINEERING & SURVEYING CONSULTANTS P.C.*

PROJECT No. **7211.02**

PROJECT: **SUNY New Paltz Vertical Expansion Bevier Hall**

LOCATION: **New Paltz, NY**

BORING No. C-3

SHEET No. 1 of 1

CLIENT: **Architecture+**

CONTRACTOR: **General Borings, Inc.**

METHOD OF ADVANCING BORING | DIA. | DEPTH

POWER AUGER: | | TO

ROT. DRILL: | | TO

CASING: | | TO

DIAMOND CORE: | | TO

Continuous Hand Driven Split Spoon

GROUND WATER	DATE	TIME	DEPTH

MON. WELL ☐ YES ☒ NO

SCREEN DEPTH: --- TO ---

WEATHER: **Clear** TEMP: **80° F**

DEPTH TO ROCK: **4.85'**

*CHANGES IN STRATA ARE INFERRED

INSPECTOR: **Scott Cohen**

DRILLER: **Jim Casson**

SURFACE ELEVATION: **325.1**

DATUM: **See Remarks**

DATE START: **8/19/14**

DATE FINISH: **8/19/14**

UNCONFINED COMPRESS. STRENGTH (TONS/FT) ● 1 2 3 4 5

PLASTIC LIMIT % ✕ WATER CONTENT % ⊗ LIQUID LIMIT % △ 10 20 30 40 50

STANDARD PENETRATION (BLOWS/FT.) ● 10 20 30 40 50

DEPTH (FT.)	N OR MIN./FT.	PENETRATION RESISTANCE (BL/6 IN.)	SAMPLES: SAMPLE NUMBER	RECOV.: LENGTH (IN.)	RECOV.: RQD (%)	MOISTURE	UNIFIED SOIL CLASS.	DESCRIPTION OF MATERIAL	LITHOLOGY*	ELEVATION (FT.)
1			S-1	4		D	SM	4" Concrete Bwn m-f SAND, and Silt, little c-f Gravel		
2										
3			S-2	14		M	SM	Bwn m-f SAND, some Silt, some c-f Gravel		
4										
5			S-3	3				Rock fragments, some c-f Gravel		320.1
								End of Boring at 4.85'		
10										315.1
15										310.1
20										305.1
25										300.1

REMARKS: Ground floor janitor supply room Deyo Hall.

BORING LOG 7211.02.GPJ TECTONIC ENG.GDT 8/28/14

TECTONIC

LEGEND FOR SOIL DESCRIPTION

COARSE GRAINED SOIL: (Coarser than No. 200 sieve)

DESCRIPTIVE TERM & GRAIN SIZE

TERM	SAND	GRAVEL
coarse - c	No. 4 Sieve to No. 10 Sieve	3" to 3/4"
medium - m	No. 10 Sieve to No. 40 Sieve	
fine - f	No. 40 Sieve to No. 200 Sieve	3/4" to 3/16"

COBBLES 3" to 10" **BOULDERS** 10" +

GRADATION DESIGNATIONS	PROPORTIONS OF COMPONENT
fine, f	Less than 10% coarse to medium
medium to fine, m-f	Less than 10% coarse
medium, m	Less than 10% coarse and fine
coarse to medium, c-m	less than 10% fine
coarse, c	Less than 10% medium and fine
coarse to fine, c-f	All greater than 10%

FINE GRAINED SOIL: (Finer than No. 200 Sieve)

DESCRIPTION	PLASTICITY INDEX	PLASTICITY
Silt	0 - 1	none
Clayey Silt	2 - 5	slight
Silt & Clay	6 - 10	low
Clay & Silt	11 - 20	medium
Silty Clay	21 - 40	high
Clay	greater than 40	very high

PROPORTION:

DESCRIPTIVE TERM	PERCENT OF SAMPLE WEIGHT
trace	1 - 10
little	10 - 20
some	20 - 35
and	35 - 50

The primary component is fully capitalized

COLOR:

Blue - blue	Gy - gray	Wh - white
Blk - black	Or - orange	Yl - yellow
Bwn - brown	Rd - red	Lgt - light
Gn - green	Tn - tan	Dk - dark

SAMPLE NOTATION:

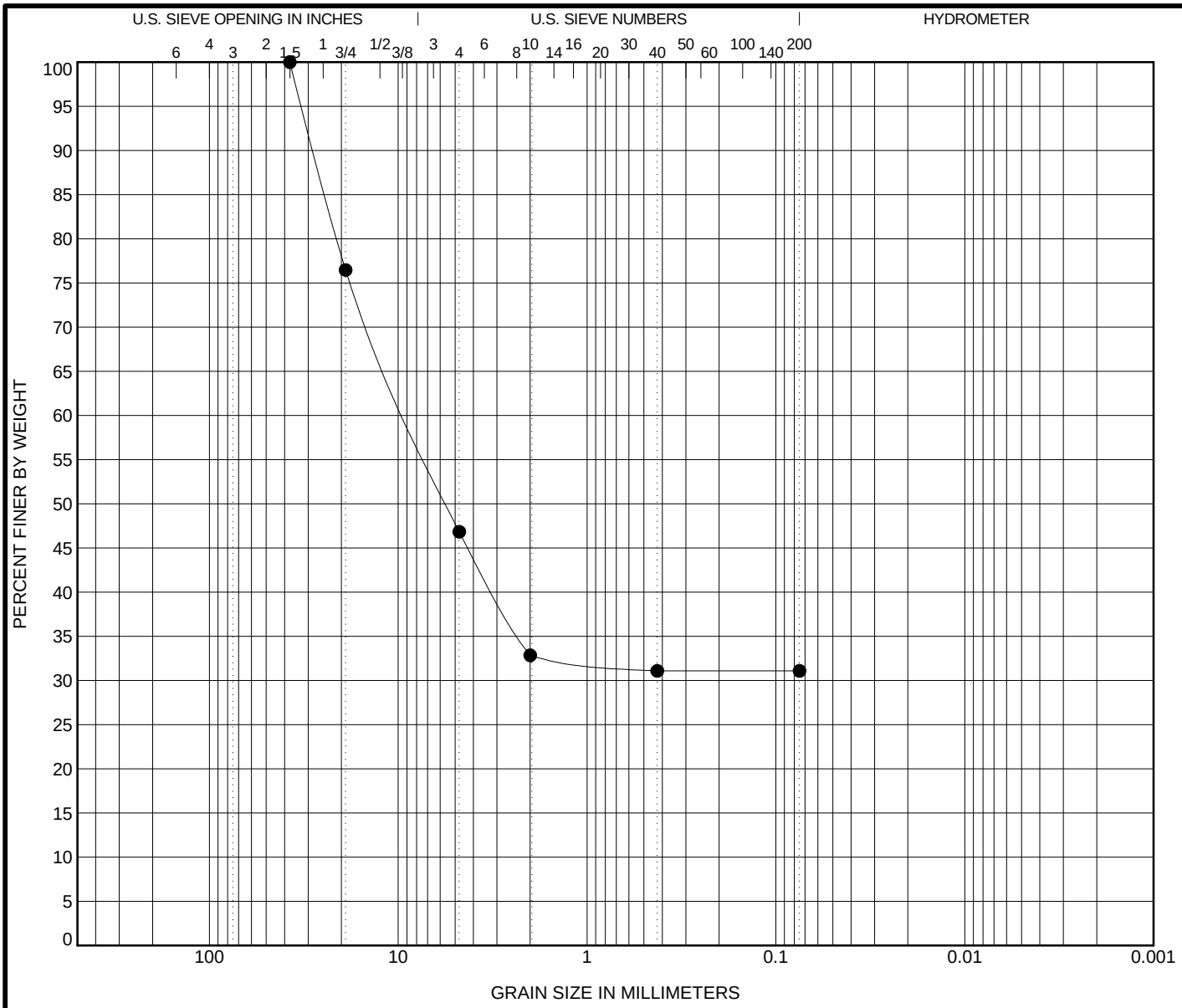
S - Split Spoon Soil Sample
U - Undisturbed Tube Sample
C - Core Sample
B - Bulk Soil Sample
NR - No Recovery of Sample

WOC - Weight of Casing
WOR - Weight of Rods
WOH - Weight of Hammer
PPR - Compressive Strength based on Pocket Pentrometer
TV - Shear Strength (tsf) based on Torvane

ADDITIONAL CLASSIFICATIONS:

New York City Building Code soil classifications are given in parentheses at the end of each description of material, if applicable. See Sections 1804.2 of the 2008 Building Code for further details.

APPENDIX II



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Identification			Classification	WC%	LL	PL	PI	Cc	Cu
●	**B-1**	**4.0**	**S-3**	**Bwn c-f GRAVEL, some Silt, little c-f Sand**	**6.9**					

	Sample Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	**%Clay**	Source of Material
●	**B-1**	**4.0**	**S-3**	**37.5**	**8.795**			**53.2**	**15.7**	**31.1**		**Boring**

TECTONIC *ENGINEERING & SURVEYING CONSULTANTS P.C.*

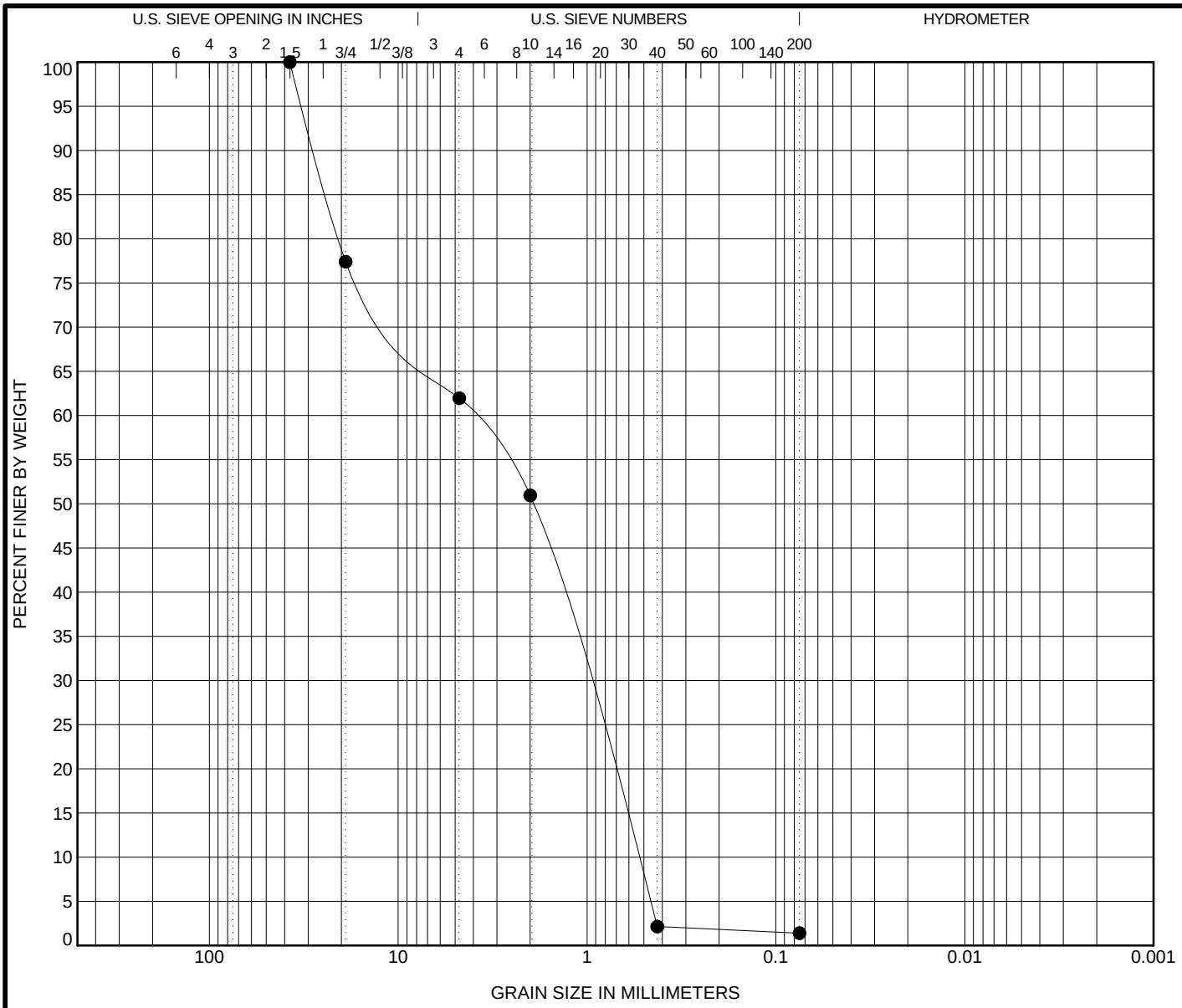
280 Little Britain Road
Newburgh, NY 12550
Telephone: (845) 563-9081 Fax: (845) 563-9085

GRAIN SIZE DISTRIBUTION

Project No: **7211.02** Date: **8/28/14**

Project: **SUNY New Paltz Bouton Hall**

Location: **New Paltz, NY**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Identification			Classification	WC%	LL	PL	PI	Cc	Cu
●	**B-2**	**5.0**	**S-3**	**Bwn c-f SAND, and c-f Gravel, trace Silt**	**13.1**				**0.48**	**7.47**

	Sample Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	Source of Material
●	**B-2**	**5.0**	**S-3**	**37.5**	**4.074**	**1.029**	**0.545**	**38.0**	**60.6**	**1.4**		**Boring**

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280 Little Britain Road
Newburgh, NY 12550
Telephone: (845) 563-9081 Fax: (845) 563-9085

GRAIN SIZE DISTRIBUTION

Project No: **7211.02** Date: **8/28/14**

Project: **SUNY New Paltz Bouton Hall**

Location: **New Paltz, NY**

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APPENDIX C

GEOTECHNICAL EVALUATION
DEYO HALL
NEW PALTZ, NEW YORK
Dente File No. JB185070

Prepared For:
Architecture + NY
297 River Street
Troy, NY 12180

June 2018

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

TABLE OF CONTENTS

APPENDICES

GEOTECHNICAL EVALUATION
DEYO HALL
NEW PALTZ, NEW YORK

Dente File No. JB185070

I. INTRODUCTION

This report presents the results of a geotechnical evaluation completed by the Dente Group for the site improvements planned at Deyo Hall at the SUNY Campus in New Paltz, New York. The evaluation was completed in general accord with Dente proposal number FDE-18-52, which was accepted by Architecture+ of Troy, New York

In general, our scope of services for this project consisted of the following:

- Review of Geotechnical studies completed by this office at nearby sites,
- Layout and completion of three test borings with UFPO and Campus Utility Scanning,
- Completion of laboratory index testing upon selected samples collected through the investigation,
- Preparation of this report, which summarizes the results of our explorations and presents recommendations to assist in planning for the geotechnical related aspects of the project.

This report and the recommendations contained within it were developed for specific application to the site and construction planned, as we currently understand it. Corrections in our understanding, changes in the structure locations, their grades, loads, etc. should be brought to our attention so that we may evaluate their effect upon the recommendations offered in this report.

It should be understood that this report was prepared, in part, on the basis of a limited field exploration. The borings were advanced at discrete locations and the overburden soils sampled at specific depths. It should be understood that conditions are only known at the locations and through the depths investigated. Conditions at other

locations and depths may be different, and these differences may impact upon the conclusions reached and the recommendations offered. For this reason, we strongly recommend that we be retained to provide site observation services during construction.

This report was prepared for informational purposes only and should not be considered part of the contract documents. It should be made available to interested parties in its entirety only. Should the data contained in this report not be adequate for the contractors' bidding purposes, the contractors may make their own investigations, tests, and analyses for use in bid preparation.

The recommendations offered in this report concerning the control of surface and subsurface waters, moisture, or vapor membranes address conventional Geotechnical Engineering aspects only and are not to be construed as recommendations for controlling or providing an environment that would prohibit or control infestations of the structure or its surroundings with mold or other biological agents.

II. SITE AND PROJECT DESCRIPTION

The site is located at the SUNY Campus in New Paltz as depicted on the USGS and Site Plan presented in Appendix A. The site is fully developed with gently sloped lawn areas with scattered trees and shrubs alongside the existing building and asphalt surfaced driveways and walks.

The site improvements planned consist of new grading, asphalt drives, low retaining walls and stormwater management features.

III. SUBSURFACE CONDITIONS

The subsurface conditions at the site were investigated through the completion of three test borings at the approximate locations shown on the plan in Appendix B. The test borings were completed using a standard rotary drill rig equipped with hollow stem augers. As the augers were advanced, the overburden soils were sampled and their relative density determined using split-spoon sampling techniques in general accord with ASTM D1586 procedures. Representative portions of the recovered soil samples were transported to our office for visual classification by a Geotechnical Engineer. Individual subsurface logs were prepared for the borings on this basis and are presented in Appendix C.

The subsurface logs should be reviewed for a description of the conditions encountered at the specific test locations. It should be understood that conditions are only known at the depths and locations sampled. Conditions at other depths and locations may be different.

Subsurface Profile

Between about 6 to 12 feet of fill material was found at the investigated locations across the site and is composed of relatively loose to firm mixtures of sand, gravel, silt and clay. The fills were likely created when the current building and site was graded and filled. The underlying native soils were brown glacial deposits of sands with gravel and silt in some areas and depths with intermediate silt and clay layers. These soils were of a firm to compact relative density throughout their depths.

Groundwater Conditions

Groundwater measurements were attempted at completion of drilling and sampling and the results are noted on the individual subsurface logs. It appears that the static groundwater level was at about 9 to 11 feet below grade at the time of this study.

IV. GEOTECHNICAL RECOMMENDATIONS

A. General Site Evaluation

Based upon our evaluation of the subsurface conditions disclosed through our investigation, we have developed the following general conclusions and recommendations to assist in planning for design and construction.

1. All existing fills may remain in place beneath exterior pavements and low retaining walls provided that their surfaces are proof-rolled and stabilized and the Owner accepts some risk that settlement may occur in the future and require greater than normal maintenance.

The following report sections provide detailed recommendations to assist in planning for design and construction. We should review plans and specifications prior to their release for bidding to allow us to refine our recommendations, if required, and confirm that our recommendations were properly interpreted and applied.

B. Seismic Design Considerations

For seismic design purposes, we evaluated the site conditions in accord with Section 1613 of the International Building Code (2015) adopted by New York State. On this basis, it was determined that Seismic Site Class “D - Stiff Profile” is applicable to this

project. Based upon the composition of the site soils, liquefaction should not occur in response to earthquake motions.

C. Site Preparation and Earthwork

The existing fills may be left in place beneath exterior pavements and low retaining walls provided that the surfaces are proof-rolled and stabilized as recommended below, and the Owner accepts some risk that settlement may occur.

Prior to placing fills, the retaining wall and pavement subgrades should be proof-rolled by completing at least three (3) passes using a steel drum roller with a static weight of at least ten (10) tons. The roller should operate in the static mode unless directed otherwise by a Geotechnical Engineer observing the work. Any subgrade soils that are or become soft and wet should be undercut and stabilized accordingly.

Imported Structural Fill should be used as fill and it should consist of well graded bank-run sand and gravel with no particles larger than three (3) inches, between 30 and 70 percent passing the No. 4 sieve, and less than 15 percent, by weight, of material finer than a No. 200 mesh sieve. The fill should not contain recycled asphalt, bricks, glass, pyritic shale, or recycled concrete, unless the recycled concrete is from a NYSDOT approved stockpile, and even then only with the owner's specific consent. The existing site soils are considered unsuitable for use as a source of structural fill and should be reserved for use in landscaped areas well away from the planned buildings and their backfills.

The Structural Fill should be placed in uniform loose layers no more than about one (1) foot in thickness where heavy vibratory compaction equipment is used. Smaller lifts should be used where hand operated equipment is required for compaction. Each lift should be compacted to no less than 95 percent of the maximum dry density for the soil which is established by the Modified Proctor Compaction Test, ASTM D1557. In landscape areas, the compaction may be reduced to 90 percent of maximum dry density.

D. Retaining Wall Foundations

The foundations may be proportioned for a maximum net allowable bearing pressure equal to 2,000 psf and should have minimum widths of 18 inches, even if this results in a bearing pressure which is less than the maximum allowable. Retaining wall foundations should bear at least four (4) feet beneath final adjacent exterior grades to afford frost penetration protection.

The site retaining walls should be designed to support lateral earth pressures together with all applicable temporary and permanent surcharge loads. Structural fill materials should be used as the retaining and foundation wall's backfill.

If the walls are free to deflect as the backfill is placed or surcharge loads applied, "Active" earth pressures may be assumed. If the walls are braced prior to backfilling or applying surcharge loads, "At-Rest" conditions should be assumed. The following design parameters are provided to assist in determining the lateral wall loads for level soil surfaces above and below the wall, whichever apply:

- Coefficient of "At-Rest" Lateral Earth Pressure $K_o = 0.50$
- Coefficient of "Active" Lateral Earth Pressure $K_a = 0.33$
- Coefficient of "Passive" Earth Pressure $K_P = 2.0$
- Total Unit Weight of Soil and Compacted Backfill $Y_T = 120$ pcf
- Coefficient of Sliding Friction (On Native or Fill Soil) $\delta_f = 0.30$

A foundation level drain should be provided for all retaining walls.

E. Pavements

It should be understood that sidewalks and pavements constructed upon the site's soils will heave as frost seasonally penetrates the subgrades. The magnitude of the seasonal heave will vary with many factors, and result in differential movements. As the frost leaves the ground, the sidewalks and pavements will settle back, but not entirely in all areas, and this may accentuate the differential movements across the pavement areas. Where curbs, walks, and storm drains meet these pavements, these differential heave and settlements may result in undesirable movements, and create trip hazards. To limit the magnitude of heave and the creation of these uneven joints to generally tolerable magnitudes for most winters, a sixteen (16) inch thick crushed stone base course, composed of Blend 57 aggregate, may be placed beneath the sensitive sidewalk, drive, etc. areas. The stone layer must have an underdrain placed within it.

Two flexible pavement sections are provided for consideration at the site dependent upon anticipated traffic types. A Heavy Section should be used for entrance drives and areas subject to repeated truck traffic, and a Light Section employed for areas subject to automobile parking and occasional delivery and/or service trucks. We should review final grading plans to determine if modifications to the pavement design are needed.

All base course layers and their subgrades should be drained through sloping and crowning of subgrades to the peripheral swales and/or french drains, or to underdrains where appropriate to the final grading plan to assure satisfactory performance.

Peripheral and intermediate under drains should also be incorporated, as well as gravel backfilled utilities with sloped subgrades, to assure that drained base courses are provided. All base course materials should be compacted to 95 percent of the material's maximum dry density as established through the Modified Proctor Test, ASTM D-1557.

MATERIAL SECTION	THICKNESS (inches)		NYSDOT SPECIFICATION
	Light Section	Heavy Section	
Wearing Course	1	1	403 Type 6
Binder Course	2	3	403 Type 3
Base Course	8	12	304 Type 2
Fabric – Mirafi 500X or Eq.	Yes	Yes	-

Rigid Portland concrete pavement may be designed to bear upon twelve (12) inches of NYSDOT Type 2 material and the synthetic fabric recommended above, and designed in accord with the recommended procedures of the American Concrete Institute or Portland Cement Association using a composite modulus of subgrade reaction equal to 150 pounds per cubic inch when constructed upon the subgrades prepared as recommended previously.

It should be understood that the recommended pavement sections were not designed to support heavy construction equipment loads which would require an augmented section. The contractor should construct temporary haul and construction roadways and routes about the site as appropriate for the specific weather conditions and construction equipment he intends to employ, and the overburden soil conditions encountered in the specific areas. Construction period traffic should not be routed across the recommended pavement sections unless augmented.

Finally, all pavements require routine maintenance and occasional repairs. Failure to provide maintenance and complete the required repairs in a timely manner will result in a shortened pavement service life.

G. Plan Review and Construction Monitoring

The Dente Group should be retained to review plans and specifications related to site grading, foundations, and earthwork prior to their release for bidding to confirm that the recommendations contained herein were properly interpreted and applied.

It should be understood that the actual subsurface conditions that exist across this site will only be known when the site is excavated. For this reason, we should be retained to monitor earthwork and bearing grade preparations for foundations, floor slabs, and pavements. The presence of the Geotechnical Engineer during the earthwork and foundation construction phases will allow validation of the subsurface conditions assumed to exist for this study and the design recommended in this report.

V. CLOSURE

This report was prepared for specific application to the project site and the construction planned using methods and practices common to Geotechnical Engineering in the area and at the time of its preparation. No other warranty, either expressed or implied, is made.

We appreciate the opportunity to be of service. Should questions arise or if we may be of any other service, please contact us at your convenience.

Prepared by,
Dente Group

Edward Gravelle

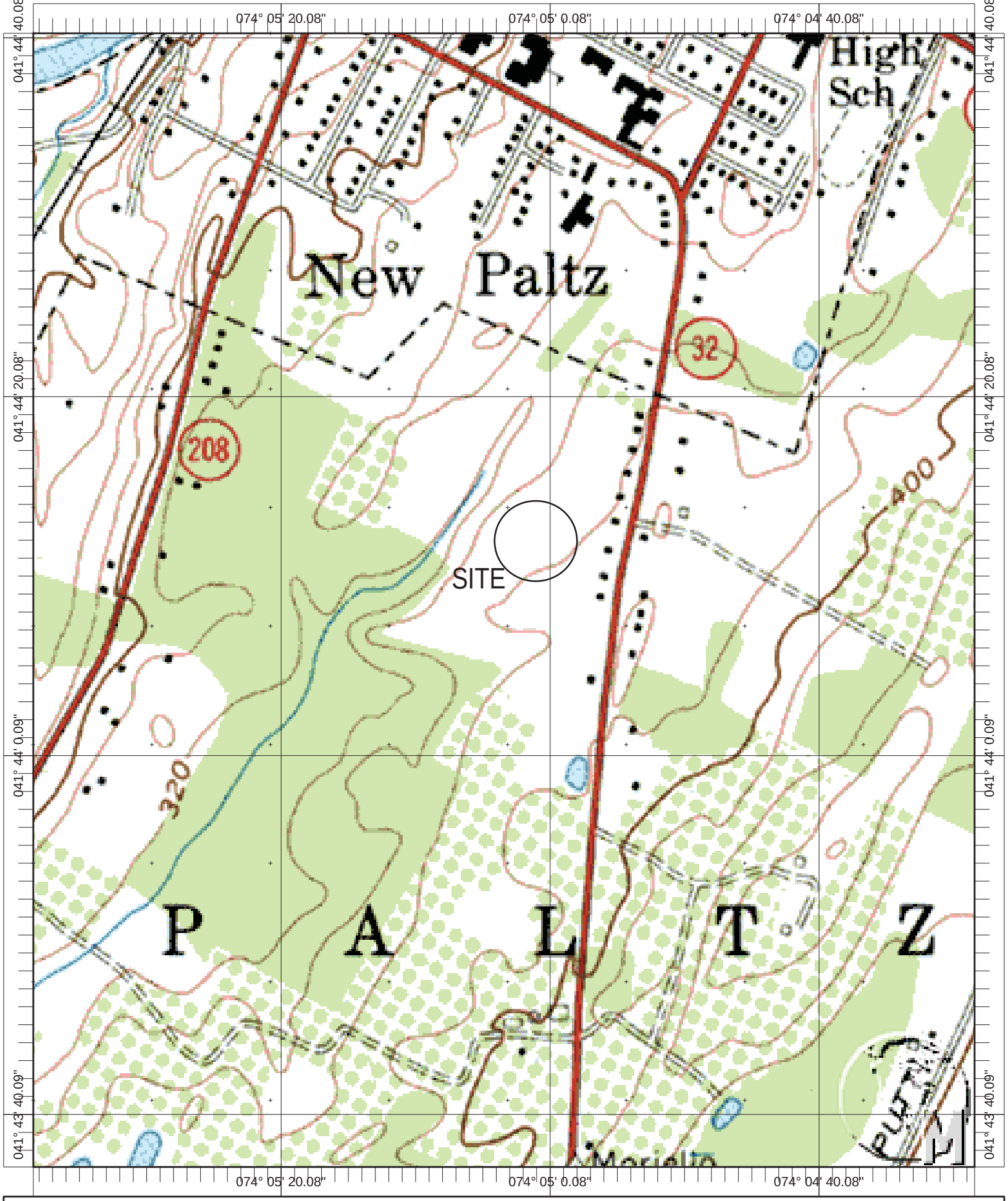
6/18/18

6/18/18 Fred Dente, P.E.
Principal

Edward Gravelle, P.E.
Senior Engineer

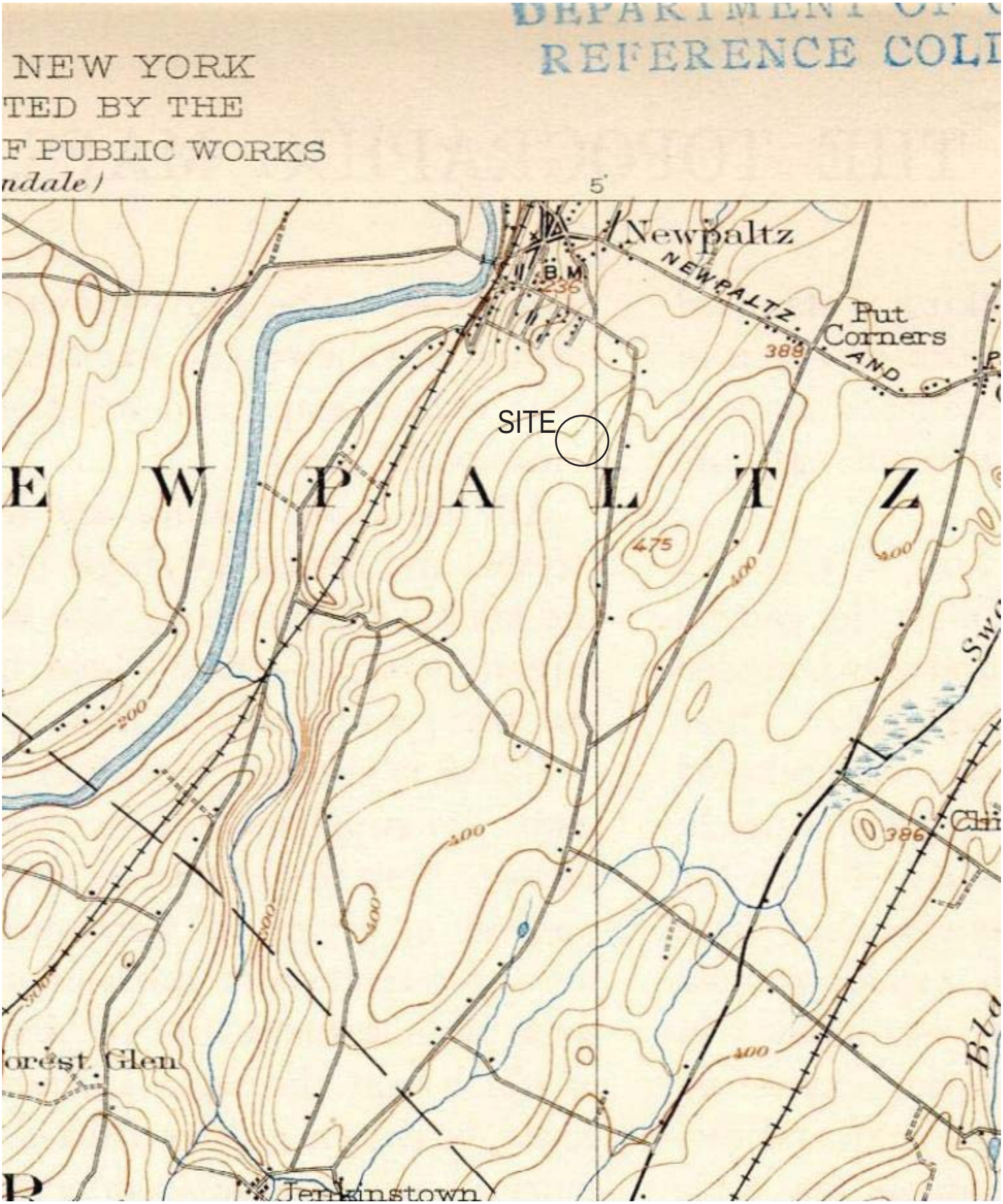
6/18/18

APPENDIX A



Name: CLINTONDALE
Date: 6/12/118
Scale: 1 inch equals 666 feet

Location: 041° 44' 08.8" N 074° 05' 03.6" W



Deyo Hall at SUNY New Paltz, New Paltz, New York 1903

Map Scale: 1:583 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ulster County, New York
Survey Area Data: Version 16, Feb 24, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 7, 2013—Feb 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BgC	Bath gravelly silt loam, 8 to 15 percent slopes	1.2	70.0%
VoA	Volusia gravelly silt loam, 0 to 3 percent slopes	0.2	11.8%
W	Water	0.3	18.2%
Totals for Area of Interest		**1.7**	**100.0%**

Ulster County, New York

BgC—Bath gravelly silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9xfq
Elevation: 800 to 1,800 feet
Mean annual precipitation: 41 to 62 inches
Mean annual air temperature: 41 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Bath and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bath

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from gray and brown siltstone, sandstone, and shale

Typical profile

H1 - 0 to 6 inches: gravelly silt loam
H2 - 6 to 28 inches: gravelly loam
H3 - 28 to 55 inches: very gravelly loam
H4 - 55 to 65 inches: very gravelly loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 26 to 38 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Lordstown
Percent of map unit: 5 percent
Hydric soil rating: No

Manlius
Percent of map unit: 5 percent
Hydric soil rating: No

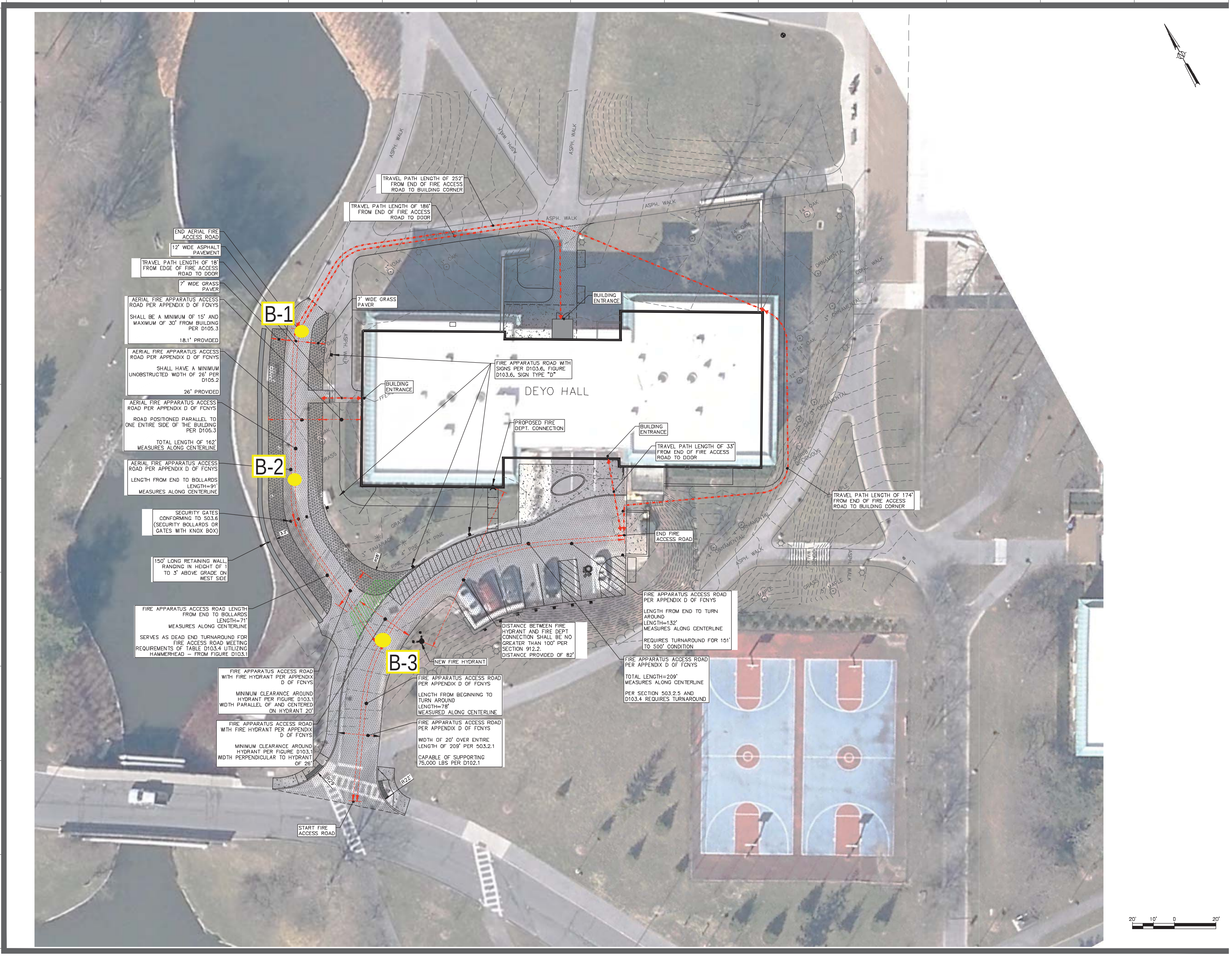
Mardin
Percent of map unit: 5 percent
Hydric soil rating: No

Volusia
Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Ulster County, New York
Survey Area Data: Version 16, Feb 24, 2018

APPENDIX B



DASNY

DORMITORY AUTHORITY STATE OF NEW YORK

Consultants:

LOMONACO & PITTS, ARCHITECTS P.C.
297 RIVER STREET
TROY, NY 12180

CONSULTANT:

Engineering and Land Surveying, P.C.
1533 Crescent Road - Clifton Park, NY 12065

Project Key

REVISIONS

Description	Date:

Project Title

STATE UNIVERSITY OF NEW YORK AT NEW PALTZ

RENOVATIONS TO DEYO HALL WITH ASBESTOS ABATEMENT

1 HAWK DRIVE NEW PALTZ, NEW YORK 12561–2443

Phase

SD SUBMISSION

FIRE ACCESS PLAN

Drawn By:	Checked By:	Date:
CAK	SNM	12/19/2017

Seal & Signature

DASNY Project No: 341830

Drawing Number: F.A.P.

Scale: 1" = 20'

6/26/2015 12:59:44 PM C:\Users\Courvillen\Documents\A328780_Central_Courvillen.rvt

APPENDIX C

INTERPRETATION OF SUBSURFACE LOGS

The Subsurface Logs present observations and the results of tests performed in the field by the Driller, Technicians, Geologists and Geotechnical Engineers as noted. Soil/Rock Classifications are made visually, unless otherwise noted, on a portion of the materials recovered through the sampling process and may not necessarily be representative of the materials between sampling intervals or locations.

The following defines some of the terms utilized in the preparation of the Subsurface Logs.

SOIL CLASSIFICATIONS

Soil Classifications are visual descriptions on the basis of the Unified Soil Classification ASTM D-2487 and USBR, 1973 with additional comments by weight of constituents by BUHRMASTER. The soil density or consistency is based on the penetration resistance determined by ASTM METHOD D1586. Soil Moisture of the recovered materials is described as DRY, MOIST, WET or SATURATED.

SIZE DESCRIPTION		RELATIVE DENSITY/CONSISTENCY (basis ASTM D1586)			
SOIL TYPE	PARTICLE SIZE	GRANULAR SOIL		COHESIVE SOIL	
BOULDER	> 12	DENSITY	BLOWS/FT.	CONSISTENCY	BLOWS/FT.
COBBLE	3" - 12"	LOOSE	< 10	VERY SOFT	< 3
GRAVEL-COARSE	3" - 3/4"	FIRM	11 - 30	SOFT	4 - 5
GRAVEL - FINE	3/4" - #4	COMPACT	31 - 50	MEDIUM	6 - 15
SAND - COARSE	#4 - #10	VERY COMPACT	50 +	STIFF	16 - 25
SAND - MEDIUM	#10 - #40			HARD	25 +
SAND - FINE	#40 - #200				
SILT/NONPLASTIC	< #200				
CLAY/PLASTIC	< #200				

SOIL STRUCTURE		RELATIVE PROPORTION OF SOIL TYPES	
STRUCTURE	DESCRIPTION	DESCRIPTION	% OF SAMPLE BY WEIGHT
LAYER	6" THICK OR GREATER	AND	35 - 50
SEAM	6" THICK OR LESS	SOME	20 - 35
PARTING	LESS THAN 1/4" THICK	LITTLE	10 - 20
VARVED	UNIFORM HORIZONTAL PARTINGS OR SEAMS	TRACE	LESS THAN 10

Note that the classification of soils or soil like materials is subject to the limitations imposed by the size of the sampler, the size of the sample and its degree of disturbance and moisture.

ROCK CLASSIFICATIONS

Rock Classifications are visual descriptions on the basis of the Driller's, Technician's, Geologist's or Geotechnical Engineer's observations of the coring activity and the recovered samples applying the following classifications.

CLASSIFICATION TERM	DESCRIPTION
VERY HARD	NOT SCRATCHED BY KNIFE
HARD	SCRATCHED WITH DIFFICULTY
MEDIUM HARD	SCRATCHED EASILY
SOFT	SCRATCHED WITH FINGERNAIL
VERY WEATHERED	DISINTEGRATED WITH NUMEROUS SOIL SEAM
WEATHERED	SLIGHT DISINTEGRATION, STAINING, NO SEAMS
SOUND	NO EVIDENCE OF ABOVE
MASSIVE	ROCK LAYER GREATER THAN 36" THICK
THICK BEDDED	ROCK LAYER 12" - 36"
BEDDED	ROCK LAYER 4" - 12"
THIN BEDDED	ROCK LAYER 1" - 4"
LAMINATED	ROCK LAYER LESS THAN 1"
FRACTURES	NATURAL BREAKS AT SOME ANGLE TO BEDS

Core sample recovery is expressed as percent recovered of total sampled. The ROCK QUALITY DESIGNATION (RQD) is the total length of core sample pieces exceeding 4" length divided by the total core sample length for N size cored.

GENERAL

- Soil and Rock classifications are made visually on samples recovered. The presence of Gravel, Cobbles and Boulders will influence sample recovery classification density/consistency determination.
- Groundwater, if encountered, was measured and its depth recorded at the time and under the conditions as noted.
- Topsoil or pavements, if present, were measured and recorded at the time and under the conditions as noted.
- Stratification Lines are approximate boundaries between soil types. These transitions may be gradual or distinct and are approximated.

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-1

PROJECT: Deyo Hall @ SUNY New Paltz	**DATE**	START: 6/4/18	FINISH: 6/4/18

LOCATION: New Paltz, New York	**METHODS:** 3 1/4" Hollow Stem Augers, ASTM
CLIENT: Architecture +	D1586 Drilling Methods with Auto Hammer
JOB NUMBER: JB185070	**SURFACE ELEVATION**:
DRILL TYPE: CME 45C	**CLASSIFICATION:** O.Burns

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	+/- 7" Asphalt, No Base
	1	17	12				**FILL:** Gray F-C SAND, SILT, and GRAVEL
				9	8	21	(MOIST)
	2	29	33				Grades Brown/Gray, roots noted
				37	50/.4'	70	
5'	3	16	14				Grades Brown
				13	9	27	
	4	4	2				Grades to Gray F-C SAND, SILT, CLAY, and
				2	2	4	GRAVEL
							(MOIST, FIRM & COMPACT TO LOOSE)
10'	5	2	2				Dark Brown to Blue/Gray SILT and CLAY,
				4	4	6	Little F-C Sand, trace gravel roots noted
							(MOIST, MEDIUM)
15'	6	6	12				**TILL:** Gray F-C SAND, SILT, and GRAVEL,
				27	20	39	Sandy Seams **(WET, COMPACT)**
							End of boring 17.0' depth.
							Groundwater measured at 10.4' depth within
20'							auger casings upon completion of borehole.
25'							

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-2

PROJECT: Deyo Hall @ SUNY New Paltz	**DATE**	START: 6/4/18	FINISH: 6/4/18

LOCATION: New Paltz, New York	**METHODS:** 3 1/4" Hollow Stem Augers, ASTM
CLIENT: Architecture +	D1586 Drilling Methods with Auto Hammer
JOB NUMBER: JB185070	**SURFACE ELEVATION**:
DRILL TYPE: CME 45C	**CLASSIFICATION:** O.Burns

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	+/- 8" Asphalt, No Base
	1	7	8				**FILL**: Gray F-C SAND, SILT, and GRAVEL
				7	8	15	(MOIST)
	2	4	9				Grades Brown/Gray Mottled F-C SAND and
				15	13	24	SILT, Little Gravel
5'	3	8	10				Grades Gray F-C SAND, SILT, and GRAVEL
				12	50/.4'	22	
10'	4	4	1				Grades (WET)
				2	3	3	
							(MOIST TO WET, FIRM TO LOOSE)
15'	5	4	7				**TILL:** Brown F-C SAND, SILT, and GRAVEL
				6	10	13	**(WET, FIRM)**
							End of boring 17.0' depth.
							Groundwater measured at 8.9' depth within
20'							auger casings upon completion of borehole.
25'							

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-3

PROJECT: Deyo Hall @ SUNY New Paltz	**DATE**	START: 6/4/18	FINISH: 6/4/18

LOCATION: New Paltz, New York	**METHODS:** 3 1/4" Hollow Stem Augers, ASTM
CLIENT: Architecture +	D1586 Drilling Methods with Auto Hammer
JOB NUMBER: JB185070	**SURFACE ELEVATION**:
DRILL TYPE: CME 45C	**CLASSIFICATION:** O.Burns

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	+/- 8" Asphalt, No Base
	1	21	16				**FILL:** Gray F-C SAND, SILT, CLAY, and
				11	14	27	GRAVEL (MOIST)
	2	5	11				
				15	12	26	
5'	3	3	3				
				2	2	5	**(MOIST, FIRM TO LOOSE)**
	4	4	10				**TILL:** Brown/Gray Mottled F-C SAND & SILT
				15	16	25	Some Gravel, Grades to NO RECOVERY
	5	50/0				50+	**(MOIST, FIRM TO VERY COMPACT)**
10'							
							End of boring 10.0' depth.
							Groundwater measured at 8.5' depth within
							auger casings upon completion of borehole.
15'							
20'							
25'							

APPENDIX D

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: JB185070.0001A
Service Date: 06/18/18
Report Date: 06/18/18
Task:

DENTE A Terracon COMPANY
594 Broadway
Watervliet, NY 12189-3709
518-266-0310

Client

Architecture + NY
Attn: Mary Kate Young
297 River St
Troy, NY 12180-3373

Project

Deyo Hall @ SUNY New Paltz
1 Hawk Drive
New Paltz, NY 12561

Project Number: JB185070

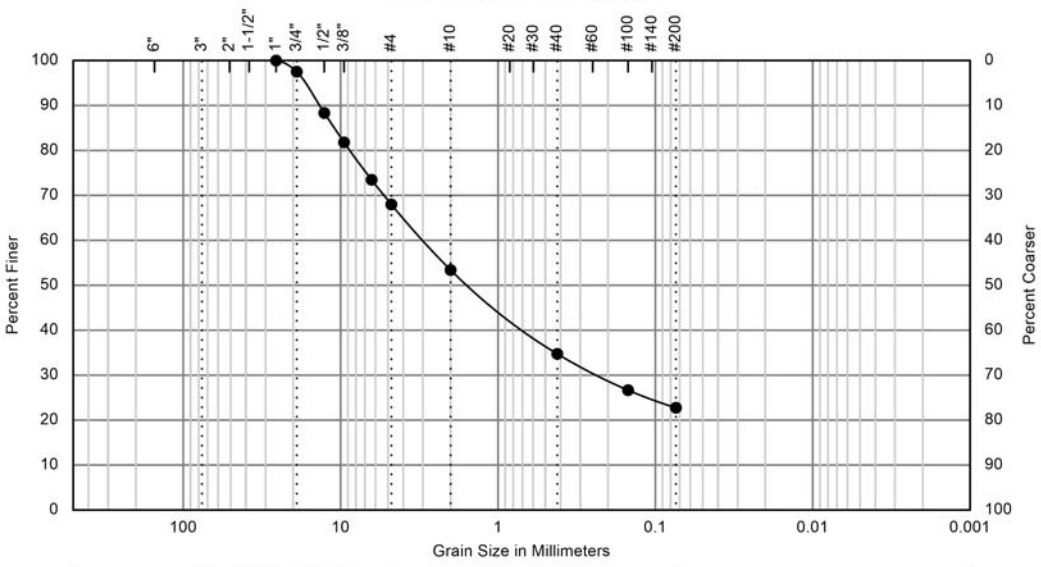
Sample Information

Sample Type:	SPT
Sample Location:	B-1/S-2 3'-5
Sample Description:	M-C-F SAND, Some F-C Gravel and Silt
USCS:	Silty sand with gravel (SM)

Laboratory Test Data

Test Method:	ASTM D6913
Method:	NA
Atterberg Limits:	LL Air - 0, LL Oven - 0, PL - 0, PI - 0
Sample Preparation:	Oven Dried
Sieving Method:	Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"			
2"			
1-1/2"			
1"	100.0		
3/4"	97.5		
1/2"	88.3		
3/8"	81.8		
1/4"	73.5		
#4	68.0		
#10	53.4		
#40	34.7		
#100	26.7		
#200	22.8		



% Cobbles	% Gravel - 32.0		% Sand - 45.2			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	2.5	29.5	14.6	18.7	12.0	22.8

*

D_{60} = 3.04	D_{30} = 0.24	D_{10} =	C_c =	C_u =	FM =

Comments:

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: JB185070.0001A
Service Date: 06/18/18
Report Date: 06/18/18
Task:

A Terracon COMPANY
594 Broadway
Watervliet, NY 12189-3709
518-266-0310

Client

Architecture + NY
Attn: Mary Kate Young
297 River St
Troy, NY 12180-3373

Project

Deyo Hall @ SUNY New Paltz
1 Hawk Drive
New Paltz, NY 12561

Project Number: JB185070

Services: Perform gradation analysis on sample of material returned to the office in general accordance with ASTM D6913.
Dente Group - A Terracon Co. Rep.: A. Barron
Reported To: N/A
Contractor: N/A
Report Distribution:

Reviewed By: Joseph Robichaud Jr.
J. Robichaud, P.E.
Department Manager

Test Methods: ASTM D6913

Deyo Hall

SUNY New Paltz

Moisture Content Results - ASTM D2216

Boring No.	B-1 / S-2	B-1 / S-4				
Sample No.	828	829				
Sample Depth	3'-5'	7'-9'				
Tare Weight	417.20	410.90				
W_S + Tare	679.50	659.20				
W_D + Tare	663.30	636.00				
W_{WATER}	16.20	23.20				
$W_{DRY\ SOIL}$	246.10	225.10				
% Moisture (W_W / W_D)	6.6	10.3				

Boring No.						
Sample No.						
Sample Depth						
Tare Weight						
W_S + Tare						
W_D + Tare						
W_{WATER}						
$W_{DRY\ SOIL}$						
% Moisture (W_W / W_D)						

Boring No.						
Sample No.						
Sample Depth						
Tare Weight						
W_S + Tare						
W_D + Tare						
W_{WATER}						
$W_{DRY\ SOIL}$						
% Moisture (W_W / W_D)						

Dente Group
A Terracon Company
594 Broadway
Watervliet, NY 12189
Ph. 518-266-0310
Fax 518-805-6001

Client: Architecture+
File No. JB185070
Date: June 13, 2018

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: JB185070.0001B
Service Date: 0A6l86l8
Report Date: 0A6l86l8
Task:

A Terracon COMPANY
594 Broadway
Watervliet, NY 12189-3709
518-2AA-0310

Client

/ rchitecture + NY
/ ttn: Mary Kate Young
297 River St
Troy, NY 12180-3373

Project

Deyo Hall @ SUNY New Paltz
1 Hawk Drive
New Paltz, NY 125Al

Project Number: JB185070

Sample Information

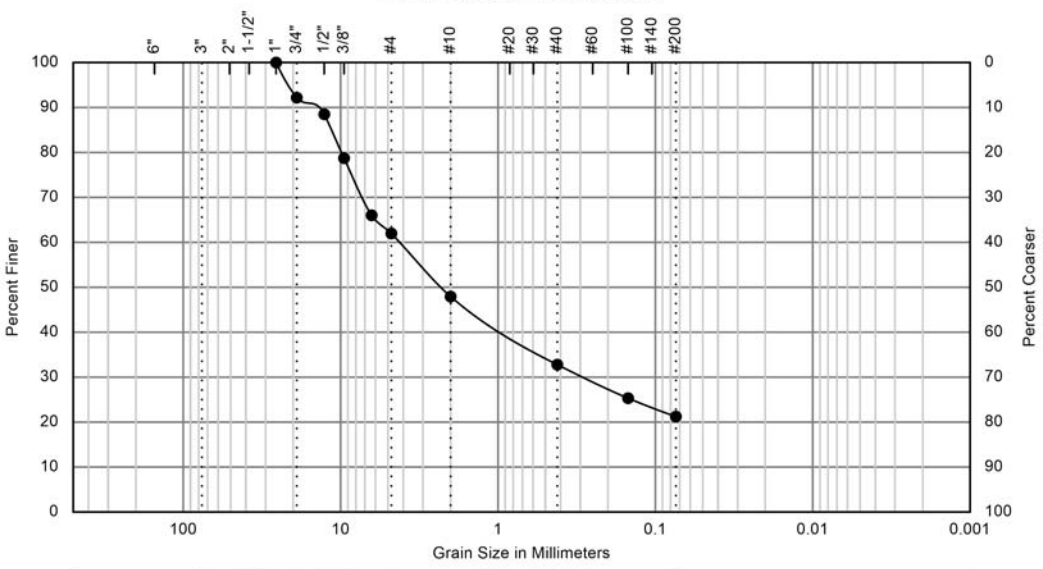
Sample Type:	SPT
Sample Location:	B-1/S-4 7'-9'
Sample Description:	M-C-F SAND and F-C GRAVEL, Some Silt
USCS:	Silty sand with gravel (SM)

Laboratory Test Data

Test Method:	ASTM D6913
Method:	NA
Atterberg Limits:	LL Air - 0, LL Oven - 0, PL - 0, PI - 0
Sample Preparation:	Oven Dried
Sieving Method:	Single Sieve-Set Sieving

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3"			
2"			
1-1/2"			
1"	100.0		
3/4"	92.2		
1/2"	88.5		
3/8"	78.7		
1/4"	66.0		
#4	62.0		
#10	47.9		
#40	32.8		
#100	25.3		
#200	21.2		

*



% Cobbles	% Gravel - 38.0		% Sand - 40.7			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	7.8	30.2	14.0	15.1	11.6	21.2

D_{60}	D_{30}	D_{10}	C_c	C_u	FM
=4.20	=0.29	=	=	=	=

Comments:

PARTICLE SIZE DISTRIBUTION REPORT

Report Number: JB185070.0001B
Service Date: 0A6l86l8
Report Date: 0A6l86l8
Task:

A Terracon COMPANY
594 Broadway
Watervliet, NY 12189-3709
518-2AA-0310

Client

/ rchitecture + NY
/ ttn: Mary Kate Young
297 River St
Troy, NY 12180-3373

Project

Deyo Hall @ SUNY New Paltz
1 Hawk Drive
New Paltz, NY 125Al

Project Number: JB185070

Services: Perform gradation analysis on sample of material returned to the office in general accordance with / STM DA913.
Dente Group - A Terracon Co. Rep.: / . Barron
Reported To: N6
Contractor: N6
Report Distribution:

Reviewed By: Joseph Robichaud Jr.
J. Robichaud, P.E.
Department Manager

Test Methods: / STM DA913

APPENDIX E

View northeast toward location B-1

View north from the area of B-3

APPENDIX D

NYL 1301-8 ^ B7

NYS DEPARTMENT OF STATE
DIVISION OF CODE ENFORCEMENT AND ADMINISTRATION

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By

Variance Attest List

Petition No: 2017-0232

The persons below are advised to TAKE NOTICE of the attached document. The attached document pertains to a petition for relief related to code requirements. If there are any ques call (518) 474-4073 and ask for the Variance Unit. Please refer to the petition number in al related conversations or correspondence with us.

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ANDREW M. CUOMO
GOVERNOR

ROSSANA ROSADO
SECRETARY OF STATE

CAPITAL REGION – SYRACUSE BOARD OF REVIEW

In the Matter of the Petition of:
SUNY NEW PALTZ
For a Variance to the New York State
Uniform Fire Prevention and Building Code

DECISION

PETITION NO. 2017-0232

Upon the application of SUNY New Paltz, filed pursuant to 19 NYCRR 1205 on August 2, 2017, and upon taking testimony and hearing argument thereon at a duly noticed hearing before the Capital Region – Syracuse Board of Review held at the Hughes State Office Building, 333 East Washington Street, Syracuse, New York, on September 21, 2017, and upon all other papers in this matter, the Board makes the following determination.

NATURE OF GRIEVANCE AND RELIEF SOUGHT

The petition pertains to alterations and additions to two existing dormitories, Occupancy Group R-2, residential, five stories in height of Type 2B, non-combustible construction with a gross area of approximately 58,000 square feet, known as Deyo Hall and DuBois Hall, located at 1 Hawk Drive, Town of New Paltz, County of Ulster, State of New York.

The petitioner is seeking relief from:

19 NYCRR Part 1227, The 2015 International Existing Building Code, Section 1105.4, provided as follows: Type B dwelling or sleeping unit where four or more Group I1, I2, R1, R2, R3, or R4 dwelling or sleeping units are being added to requirement of Section 1107 of the International Building Code for Type 2B units are required.

19 NYCRR, Part 1221, The 2015 International Building Code, Section 1107.6.2.2.2, provides as follows: Type B units where there are four or more dwelling units or sleeping units intended to be occupied as a residence in a single structure, every dwelling unit and sleeping unit intended to be occupied as a residence shall be a Type B unit.

[The Petitioner is requesting relief to place Type B units throughout the existing structure rather than in the new addition as required by Code.]

FINDINGS OF FACT

1. A fourth-floor addition is proposed for each building, but because of the existing structural and mechanical constraints, all the units on the fourth floor cannot be constructed as Type B units as required by the Code. The Petitioner states the University currently has approximately 35 to 40 accessible ground floor level units, and historically there have never been more than three wheelchair-using residents on campus.
2. Code Enforcement Officials have been consulted in this matter and wrote a letter in support of the Petitioner's request for relief. Testimony was provided that indicates that the total number of accessible sleeping rooms that will be provided will be greater than the total number required by the New York State Codes. However, the units, rather than being located all on the fourth floor, will be dispersed throughout the building.
3. A letter from the Director of Office of Residential Life notes that the ground floor is the preferred location for accessible units in an emergency.

CONCLUSIONS OF LAW

This proposed variance will not substantially adversely affect the Uniform Code's provisions for health, safety and security. Strict compliance Uniform Fire Prevention and Building Code would not achieve its intended objective, would be physically impracticable, or would be unnecessary in light of alternatives which, without a loss in the level of safety, achieve the intended objective of the code.

DETERMINATION

WHEREFORE IT IS DETERMINED that the application for a variance from 19 NYCRR Part 1227, The 2015 International Existing Building Code, Section 1105.4 and 19 NYCRR, Part 1221, The 2015 International Building Code, Section 1107.6.2.2.2, be GRANTED with the following conditions:

1. That with the addition, that the total number of accessible units in the building shall be equal or greater than those that would be required on the alteration Level 3 areas throughout the rest of the building.

2. That all other aspects of this building and construction shall be in compliance with the applicable codes, rules, and regulations.

Furthermore, it should be noted that the decision of the Board is limited to the specific building and application before it, as contained within the petition, and should not be interpreted to give implied approval of any general plans or specifications presented in support of this application.

Chairman C. Thomas Parsons, and members, Michael McQuade, Andrew Garlock, and Robert Almy all concur.

So ordered.

Capital Region – Syracuse Board of Review

C. Thomas Parsons

By: C. Thomas Parsons, Chairman

Date: 10/16/17

NMC:eh