SECTION A

BID NO.: 658	**PROJECT NAME & LOCATION:** CUNY Queens College 65-30 Kissena Blvd. Flushing, NY 11367
Description: Furnish and Deliver an Air Handling Unit **Bid Open Location**: DASNY 515 Broadway, Albany, NY 12207	
Bid Open Date: March 6, 2020 **Bid Open Time**: **2:30 p.m.**	**Contact**: Theresa Graffeo

NOTICE TO BIDDERS

MAIL BIDS EARLY

Sealed bids will be received by DASNY at the above address for the items listed in the attached Bid Breakdown and Schedule. When submitting your bid you must:

1. Prepare your bid on the attached Bid Breakdown and Schedule. Return one signed original of the Bid Breakdown and Schedule

2. If your bid deviates from Specifications, explain such deviations or qualifications on your letterhead, setting forth therein such explanations, and attach them to the Bid Breakdown and Schedule.

3. Submission of a bid constitutes full knowledge and acceptance of all provisions of the Notice to Bidders, all information referenced in the Purchasing General Conditions, Supplemental and Detailed Specifications, the Bid Submission and any Supplemental General Requirements contained herein, as well as any addenda issued in relation to the Invitation for Bids.

4. Each bid shall bear on the outside of the envelope the name of the bidder, address, telephone number and designated as a bid for the following:
   DASNY Bid No. 658
   Bid Opening Date: 3/6/2020 @ 2:30PM
   Return to:
   DASNY
   Attn: Purchasing Unit
   515 Broadway
   Albany, NY 12207-2964

When a sealed bid is placed inside another delivery jacket, the bid delivery jacket must be clearly marked on the outside **"BID ENCLOSED"** and **"ATTENTION: PURCHASING UNIT".** The Dormitory Authority will not be responsible for receipt of bids which do not comply with these instructions.

5. Mail bid responses early in order for them to be received before the time of the bid opening. **Late bids will be automatically rejected**. Individuals submitting bids in person or by private delivery services should allow sufficient time for processing through building security to assure that the bids are received prior to the deadline for submitting bids. All individuals who plan to attend bid openings will be required to present government-issued picture identification to building security officials and obtain a visitor's pass prior to attending the bid opening.

6. In accordance with State Finance Law § 139-j and 139-k, this solicitation includes and imposes certain restrictions on communications between Dormitory Authority personnel and an Offerer during this procurement process. Designated contact for this solicitation is: Theresa Graffeo, Purchasing Coordinator, at Dormitory Authority – State of New York, 515 Broadway, Albany, NY 12207, (518) 257-3583. Contacts made to other Dormitory Authority Personnel regarding this procurement may disqualify the Offerer and affect future procurements with governmental entities in the State of New York. Please refer to the Authority's website www.dasny.org for Authority policy and procedures regarding this law, or the NYS office of General Services website www.ogs.ny.gov/BU/PC/ for more information about this law.

Bid No.: 658

If you are not submitting a bid it is requested that you complete and return the lower portion of this form

(Please check all that apply and provide comments in the space provided, if necessary)

- ☐ We are not Submitting a bid.
- ☐ We Request removal of our name from the mailing list.
- ☐ Location of the job site.
- ☐ Commodity is not carried by our company.
- ☐ Scope is too large.

Other/Additional Explanation: _____

_____

NAME OF BIDDER: _____

ADDRESS: _____

Street City State Zip

Telephone

_____ _____

Signature of Bidder Official Title

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GENERAL SPECIFICATIONS

(1) The enclosed Purchasing General Conditions are hereby incorporated by reference. Submission of a bid response shall constitute acceptance of such conditions. Any exceptions/clarifications/qualifications to these conditions or other specifications and/or requirements contained herein must be clearly stated in the bid response and, depending upon the nature of such, may be grounds for rejection of your bid.

(2) Bids must be submitted in the bidder's full legal name, or the bidder's full legal name plus a registered assumed name, if any.

(3) All NYS bidders are required to be registered to do business with the NYS Department of State or their local County Clerk, whichever is applicable.

(4) All out-of-state bidders will be required to provide proof of registration to do business in their state. All out-of-state bidders that "do business in New York State" MUST BE REGISTERED WITH THE NYS DEPARTMENT OF STATE. Please contact the NYS Department of State at (518) 473-2492. Information is available at the DOS website: www.dos.ny.gov

(5) DASNY is required by law to notify the Empire State Development of any procurement contract for one million dollars or more that is to be awarded to an out-of-state vendor. This notice must be done simultaneous to the notification of award provided to the vendor. A purchase order or contract cannot be issued until fifteen (15) days after such notification is provided.

(6) Empire State Development is required by law to identify states and other jurisdictions that impose preferences or other penalties against New York bidders. DASNY is precluded from soliciting bids or entering into procurement contracts with companies that have their principal place of business located in one of the listed jurisdictions, unless the procurement is for a product that is substantially manufactured in New York State or the services are to be performed in New York State. Currently, this list of jurisdictions includes the states of Alaska, Hawaii, Louisiana, South Carolina, West Virginia and Wyoming.

(7) Unless otherwise indicated, any reference to brands or model numbers is intended to establish a standard. Items of all manufacturers will be considered, provided the item is determined to meet or exceed the required specification. DASNY's decision as to whether a substitute item meets specification will be final. Your attention is directed to Article II-7, Page 5 of the General Conditions. In order to evaluate substitute items, detailed specifications must be submitted for any product that is other than the one(s) specified in the bid.

GENERAL SPECIFICATIONS CONTINUED

(8) Unless otherwise noted, guarantee on all items is to be one year as detailed in Article XVI of the General Conditions

(9) All upholstered furniture and drapery panels and lining must meet strict flammability requirements. Standards applicable to this bid, if any, will be delineated in the Detailed Specifications.

(10) LABOR/TRADES - Any labor, materials or means whose employment, or utilization during the course of this contract, shall not in any way cause or result in strike, work stoppages, delays, suspension of work; or similar troubles by workers employed by this contractor or his subcontractors, or by any of the trades working in or about the buildings and premises where work is being performed. Any violation by the contractor of this requirement may in the sole judgment of DASNY be considered as proper and sufficient cause for declaring the contractor to be in default, and for the owner to take action against him as set forth in the Purchasing General Conditions, Article VIII, “Termination", or such other action as DASNY may deem proper.

(11) Bid results are available on the DASNY website (www.DASNY.org). Bid results will not be given over the phone.

(12) If you are a NYS Certified Minority or Women Owned Business, please include a copy of your certification with the bid.

SUPPLEMENTAL SPECIFICATIONS

The following items are attached for informational purposes. Referenced documents need not be returned with the proposal. These documents are only applicable to the successful bidder and the ensuing procurement contract. Documents are only applicable to the successful bidder and the ensuing procurement contract. Documents applicable to the procurement that will result from this Invitation for Bids are designated by a check box (☒). Unless otherwise indicated, the referenced documents are located at the end of this Invitation for Bids.

☒ **Purchasing General Conditions** – The DASNY Purchasing General Conditions contains terms and conditions of purchases made by DASNY. It is recommended that this document be reviewed fully.

☐ **M/WBE Utilization Plan and Request for Waiver** - Minority and Women-Owned Business Enterprise (M/WBE) goals for this project are 0% and 0%, respectively. The successful bidder shall be required to complete a Utilization Plan or Request for Waiver, to be approved by DASNY's Opportunity Programs Group. Reference Purchasing General Conditions, Article XIX, Affirmative Action for Contracts Mr. Michael Clay, DASNY Opportunity Programs Group at (518) 257-3464, is available to assist all bidders in attaining these goals. *Reference the enclosed "Good Faith Efforts Guidelines".*

☒ **Supplemental General Requirements** – Attached (if applicable) are the Supplemental General Requirements (SGRs) which provide important logistical information and additional conditions which govern this procurement. Please read these SGRs carefully.

☐ **Form of DASNY Contract** – The procurement resulting from the Invitation for Bids will be executed through a DASNY purchase order and a related contract. The contract executed with the successful bidder will be in the same substantial form as the attached "Form of Contract". Note that this Invitation for Bids and any response to such will be annexed as binding terms of the purchase agreement.

☐ **Certificate of Insurance** *(sample enclosed)* – The successful bidder will be required to provide a Certificate of Insurance pursuant to Article XIV of the enclosed Purchasing General Conditions. The certificate shall name DASNY and other designated parties as additional insureds.

SUPPLEMENTAL SPECIFICATIONS CONTINUED

☐ **Worker's Compensation / Disability Insurance** – The successful proposer will be required to provide specific documentation with respect to Worker's Compensation and Disability Insurance pursuant to Article XIV of the enclosed Purchasing General Conditions. Requirements are detailed in the enclosed "Workers' Compensation and Disability Benefits Requirements" document.

☐ **Prevailing Wage Schedule** – NYS Labor Law requires all wages paid by contractors and subcontractors on public work projects be paid at the prevailing wage rates. Enclosed is the current rate schedule for the appropriate county. Contractors and Subcontractors are responsible for obtaining current rates throughout the course of the project. The NYS Department of Labor (NYS DOL) updates these rates on July1st of each year. Current rates can be obtained on the NYS DOL website (www.labor.state.ny.us) or by fax at (518) 485-1870. Note that an executed Contractor and Subcontractor Certification and certified payrolls, which include the hours and days worked by each workman, laborer or mechanic, the occupation at which he worked, the hourly wage rate paid and the supplements paid or provided, must be submitted with each and every payment requisition. **DASNY will not process an invoice without this information.** Forms are available on the DASNY website: http://www.dasny.org/construc/forms2/vendors.php

☐ **Labor and Material Payment Bond –** The successful bidder must be prepared to provide surety bonds prior to award in accordance with Article XIV of the DASNY Purchasing General Conditions. The costs of these bonds are to be separately stated in the total bid price as indicated on the Bid Breakdown and Schedule.

☐ **Performance Bond –** The Successful bidder must be prepared to provide surety bonds prior to award in accordance with Article XIV of DASNY Purchasing General Conditions. The costs of these bonds are to be separately stated in the total bid price as indicated on the Bid Breakdown and Schedule.

☒ **Standard Vendor Responsibility Questionaire (SVRQ) –** The successful proposer, in accordance with Article XXII of DASNY Purchasing General Conditions, will be required to complete the enclosed SVRQ. The award of a contract will be subject to a review of the information contained in these forms.

SUPPLEMENTAL SPECIFICATIONS CONTINUED

☐ **NYS Uniform Contracting Questionaire (UCQ) –** The successful proposer will be required to complete the enclosed UCQ. The award of a contract will be subject to a review of the information contained in these forms.

☐ **DASNY Contractor and Consultant Questionaire (CCQ)** – The successful proposer will be required to complete the enclosed CCQ. The award of a contract will be subject to a review of the information contained in these

ANDREW M. CUOMO
Governor

ALFONSO L. CARNEY, JR.
Chair

REUBEN R. MCDANIEL, III
Acting President & CEO

Supplemental General Requirements

Requests for Information:

All questions pertaining to Bid No. 658 – Furnish and Deliver an Air Handling Unit are due no later than 4:00 P.M. on February 21, 2020 to tgraffeo@dasny.org. RFI Responses will be posted via Addenda to DASNY's Website in the Attachments Section of the Bid Opportunity Page for Bid No. 658.

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Detailed Specifications

SECTION 237416.13 - AIR-HANDLING UNITS

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 packaged, outdoor, air-handling units:

1. AHU-1 (Heat- Steam, Cooling- Condensing unit)
2. ACC-1
3. AHU-3 (Heat- Electric, Cooling- Electric)

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. AHU: Air Handling unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

C. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

D. ACC-Air Cooled Condensing Unit

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each unit, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, unit performance data including sound data, door sizes and elevations, drain pan detail, control panel layout, fan sound data, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

2. Furnish fan performance rating and fan curve with specified operation points clearly plotted

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which AHUs will be attached.
2. Roof openings

B. Field quality-control test reports.

C. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For AHUs to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: two (2) sets of filters for each unit.

1.8 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for AHUs.
2. Comply with ARI 270 for testing and rating sound performance for AHUs.

B. ASHRAE Compliance:

1. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. UL Compliance: Comply with UL 1995.

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.

F. Standard catalog unit requiring modification to meet this specification shall not be considered or accepted. The manufacturer must have been a manufacturer of the package energy recovery equipment for at least ten years prior to the date of bidding on this equipment. The complete package unit including air- to air heat exchanger must be manufacturer in the United States of America.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of AHUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard.
2. Warranty Period for Control Boards: Manufacturer's standard.

PART 2 - PRODUCTS

A. Manufacturers: Subject to compliance with requirements (Basis of Design-Trane), provide products by one of the following:

1. Carrier Corporation; a unit of United Technologies Corp.
2. Daikin Applied.
3. YORK; a Johnson Controls company.

2.2 BASE FRAME

A. The base of the package shall be an all-welded structural “C” channel steel frame with required tubular and angular cross-member as required to maintain floor rigidity and stiffness and act as isolated supports – all solid welded in place. The base shall be painted with one coat of lead free, rust-inhibiting, alkyd metal primer, followed by two coats corrosion and weather resistant 100% acrylic latex paint. Unit up to 300-inches long shall include no more than four lifting lugs. Lugs shall be an integral part of the structural frame and be all welded using three-pass welds. Frame shall be constructed to limit deflection to1/200th of its span in any direction. Bolted or screwed frame and floor assemblies are not acceptable due to their poor structural integrity and propensity to leak.

2.3 CABINET

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

C. Inner Casing Fabrication Requirements:

1. Inside Casing: G-90-coated galvanized steel, 0.034 inch thick, perforated 40 percent free area.

D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071, Type I.
2. Thickness: 2 inches.
3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
4. Liner Adhesive: Comply with ASTM C 916, Type I.

E. Condensate Drain Pans: Formed sections of stainless-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.

1. Single-Wall Construction: 16 gauge stainless steel with spray foam insulation.
2. Drain Connections: Threaded nipple both sides of drain pan.

F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.4 FANS

A. Direct-Driven Supply-Air Fans: Double width, backward inclined, centrifugal; with permanently lubricated, motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls. Fan shall be spring isolated with flexible duct connection to isolate the fan from the cabinet housing.
1. Fan performance shall be based on test and procedures performed in accordance with AMCA publication 211 and publication 311 and comply with the requirement of the AMCA certified rating program. Fans shall bear the AMCA seal

B. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

C. Motor Requirements for HVAC Equipment."

D. Motor starter: Variable frequency drives for supply and return fans with bypass in NEMA 3R enclosure mounted on the unit.

2.5 COILS

A. The coil section shall be provided complete with coil and coil holding frame. The coils shall be installed such that headers and return bends are enclosed by unit casings. If two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil and be of the same material as the primary drain pan. Like the primary drain pan, the intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil. Intermediate drain pan shall include downspouts to direct

condensate to the primary drain pan. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

Casing penetrations supplied for hydronic drain and vents. Piping contractor shall provide extended piping.

No casing penetrations supplied for hydronic drain and vents. If required, piping contractor will need to drill drain and vent penetrations using factory located features provided in coil panel.

B. Refrigerant Cooling Coils: R-410A

The coils shall have aluminum fins and seamless copper tubes. The fins shall have collars drawn, belled, and firmly bonded to tubes by mechanical expansion of the tubes. Suction and liquid line connections shall extend to the unit exterior. The coil casing may be galvanized or stainless steel.

The coils shall be proof-tested to 715 psig and leak-tested to 300 psig air pressure under water. After testing, the inside of the coils shall be dried, all connections shall be sealed, and the coil shall be shipped with a charge of dry air.

Suction headers and liquid connections shall be constructed of copper tubing with connections penetrating unit casings to permit sweat connections to refrigerant lines. The coils shall have equalizing vertical distributors sized according to the capacities of the coils. Coils are certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table1 of the Standard. Refrigerant coil tubes are 1/2" OD, 0.016"thick, internally enhanced copper.

C. Steam Heating Coil

The coils shall have aluminum fins and seamless copper tubes. Copper fins may be applied to coils with 1-inch tubes. The fins shall have collars drawn, belled, and firmly bonded to tubes by mechanical expansion of the tubes. The coil casing may be galvanized or stainless steel.

Non-freeze, steam-distributing-type coils shall be provided. Steam coils shall be pitched in the unit for proper drainage of steam condensate from coils. The coils shall be proof-tested to 300 psig and leak tested to 200 psig air pressure under water. Coil header connections are constructed of cast iron with female connections. Connections do not extend beyond unit casing. Inner tubes shall have orifices that ensure even steam distribution throughout the full length of the outer tube. Orifices shall be directed toward the return connections to ensure that the steam condensate is adequately removed from the coil. Coils are certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating. Tube construction shall be a 11/16" OD, 0.031" copper inner tube with a 1" OD, 0.031"copper outer tube.

D. Humidifier Section (Direct Steam)

Humidifier section shall be provided with a humidifier panel designed for building steam. Humidifier panel shall include stainless steel construction of all wetted parts including the integrated header/separator and multiple tube dispersion assembly. Tube-to-header joints shall consist of welded stainless steel. Humidifier shall provide a uniform steam discharge. Humidifiers shall be provided with a control valve, inverted bucket steam trap, wye strainer, and two float and thermostatic steam traps shipped loose for field installation. All pipe connections shall be made from one side of the air handler.

2.6 DIRECT DRIVE PLENUM FAN SECTION

The fan type shall be provided as required for stable operation and optimum energy efficiency. The fan shall be a single-width, single-inlet, multiblade-type direct-drive plenum fan. Motor bearing life of the direct-drive plenum fan shall be not less than L-10 250,000 hrs.

Fans that are selected with inverter balancing shall first be dynamically balanced at design RPM. The fans then will be checked in the factory from 25% to 100% of design RPM to insure they are operating within vibration tolerance specifications, and that there are no resonant frequency issues throughout this operating range. Inverter balancing that requires lockout frequencies inputted into a variable frequency drive to in order to bypass resonant frequencies shall not be acceptable. If supplied in this manner by the unit manufacturer, the contractor will be responsible for rebalancing in the field after unit installation. Fans selected with inverter balancing shall have a maintenance free grounding assembly installed on the fan motor to discharge both static and induced shaft currents to ground.

On units supplied with plenum fans, expanded metal door guard(s) shall be supplied on the access door(s) to the fan and those downstream access door(s) where unintended access to the plenum fan could occur. Door guard is intended to deter unauthorized entry and incidental contact with rotating components.

2.7 ACCESS/INSPECTION / TURNING SECTION

A section shall be provided to allow additional access/inspection of unit components and space for field-installed components as needed. An access door shall be provided for easy access. All access sections shall be complete with a double-wall, removable door downstream for inspection, cleaning, and maintenance. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels, respectively. All doors downstream of cooling coils shall be provided with a thermal break construction of door panel and door frame.

2.8 AIRFLOW MEASUREMENT STATION (STD. TRAQ DAMPERS)

A factory-mounted airflow measurement station tested in accordance with AMCA Standard 611 and bearing the AMCA Ratings Seal for Airflow Measurement Performance shall be provided in the outdoor air opening to measure airflow. The damper blades shall be galvanized steel, housed in a galvanized steel frame and mechanically fastened to a rotating axle rod. The dampers shall be rated for a maximum leakage rate of 4 cfm/ft² at 1 in. w.g. complying with ASHRAE 90.1 maximum damper leakage. The standard airflow measurement station shall be capable of measuring from 15 percent to 100 percent of unit nominal airflow. The airflow measurement station shall adjust for temperature variations and provide a 2 to 10 Vdc signal that corresponds to actual airflow for controlling and documenting airflow. The accuracy of the airflow measurement station shall be ±5 percent.

2.9 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. See schedule on drawings for data.
2. Unit shall include a clogged filter switch.
3. Units shall include a Magnehelic gauge mounted in the controls compartment.

FACTORY-SUPPLIED CURB

Outdoor AHU will be provided with a factory-supplied roof curb. Curb will be shipped to jobsite disassembled. Contractor will be responsible for assembly and mounting to roof structure per the Roof Curb Manual. Units with factory-supplied external piping cabinet(s), the factory-supplied curb will include a curb section for the pipe cabinet(s).

2.10 INLET HOODS

Inlet hoods are provided on the outside air openings and equipped with high performance moisture eliminators to minimize water carryover from the outside into the unit casing. Eliminators also perform the function of a bird screen to prevent nesting.

2.11 EXTERNAL PIPE CABINETS

Piping cabinet is supplied factory-assembled and will be double wall, foam injected construction. Piping cabinets are shipped separate to be field installed on the side of the unit.

2.12 HIGH PERFORMANCE FLOW METER

The fan shall have an airflow measurement system to measure fan airflow directly or to measure differential pressure that can be used to calculate fan airflow. The system shall predict airflow within +/- 5 percent total accuracy (device & transmitter) when operating within the stable operating region of the fan curve. On units supplied with multiple direct drive fans, one transducer is supplied for each fan in the array. The submitted fan airflow performance and noise levels shall not be affected by the installation of the device. Any device that provides an obstruction to the fan inlet will not be accepted.

Multiple VFDs, on a common panel, shall be provided for each fan array to provide redundancy in case of loss of function of one of the VFDs or fan motors. Individual VFDs shall be sized based on motor FLA to reduce overall panel input current. In the event of a VFD failure, the remaining VFDs must be capable of compensating and maintaining normal fan array operation. VFD panel shall have a common disconnect that is accessible from the outside of the unit. Disconnect shall open input power to all VFDs simultaneously. Disconnect shall be lockable in the off position. Disconnect shall utilize circuit breaker to provide overcurrent and short circuit protection. VFD panel shall be provided with a single point of field connection for field input power. Each VFD shall be supplied with independent input fusing, as required. VFDs shall be capable of onboard diagnostics to monitor individual fan motor performance. Externally mounted VFDs shall be provided with independent keypad. VFD panel shall be provided with a common point connection for speed input signal, start/stop signal, and fault status.

Field safety interlock relay shall be field wired and provided The supply fan's VFD shall be mounted internal of unit casing in the controls section. The internal enclosure shall be an integral part of the unit casing to allow for thermal venting to casing interior, but shall be accessible from unit exterior through access door. Internally mounted starters shall have doors with the same construction as other doors on unit. An external disconnect shall be mounted through the door to the VFD to disconnect full power from VFD.

Each fan in the multiple-fan array shall be provided with integral back flow prevention: a backdraft damper that prohibits recirculation of air in the event a fan or multiple fans become disabled. Dampers are tested and rated based on AMCA Standard 500. Dampers to be heavy duty type capable of a maximum back pressure that exceeds the design total static pressure with minimal leakage. The dampers should have a minimal total effect on airflow performance-both pressure drop when open and system effect on the fan. The damper blades and frame shall be

extruded aluminum with blade edge seals locked into the blade edge. Adhesive type seals are unacceptable. AHU manufacturer responsible for providing proper spacing upstream of dampers to ensure full, uniform airflow through upstream components. For units where the damper(s) are supplied at the jobsite, the installing contractor shall contract a certified TAB contractor to verify uniform airflow thru upstream components.

2.13 CONDENSING UNIT SECTION (AHU--1 only)

A. GENERAL DESCRIPTION

1. Furnish as shown on plans, Condensing Unit. Unit performance and electrical characteristics shall be per the job schedule.
2. Configuration: Fabricate as detailed on prints and drawings.
3. The complete unit shall be listed.
4. Unit shall be completely factory assembled and shipped in one piece.
5. Unit to be shipped with a nitrogen holding charge only.
6. The unit shall undergo an operational test prior to shipment. The factory test shall include a refrigeration circuit check test, a unit safety control system operations checkout, and a final unit inspection.
7. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.
8. Performance: All scheduled capacities and face areas are the minimum accepted value. All scheduled amps, KW, and HP are maximum accepted values that allow scheduled capacity to be met.

B. CABINET

1. Exterior surfaces shall be constructed of pre-painted galvanized steel for aesthetics and long term durability. Exterior G90 galvanized wall panels shall be pressure wash cleaned and degreased prior to application of primer. BASF paint system shall include 0.20 average mil primer and 0.75 average mil texture finish top coat. Paint system shall comply with ASTM B117 2000-hour salt fog resistance test.
2. Lifting brackets shall be provided on the unit base with lifting holes to accept cable or chain hooks.

C. ELECTRICAL

1. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with unit shall be number and color coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch circuit short circuit protection, 115 volt control circuit transformer and fuse, system switches, and a high temperature sensor. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Knockouts shall be provided in the side of the main control panels for field wiring entrance. All 115-600 volt internal and external wiring between control boxes and components shall be protected from damage by raceways or conduit.

2. The receptacle shall be powered by a factory installed and wired 120V, 15 amp power supply. The power supply shall be wired to the line side of the unit's main disconnect, so the receptacle is powered when the main unit disconnect is off. This option shall include a weather proof transformer and disconnect. The electrical circuit shall be complete with primary fused, overload protection.
3. Single non-fused disconnect switch shall be provided for connecting electrical power at the unit. Disconnect switches shall be mounted internal to the control panel and operated by an externally mounted handle. Externally mounted handle is designed to prohibit opening of the control panel door without the use of a service tool.

D. CONTROLS
1. Unit shall be equipped with a 120V terminal strip for field supplied and installed controls. Controls to be supply by Siemens or an approved equal.

E. AIR COOLED CONDENSER
1. Unit shall have at least one head pressure sensing condenser fan controlled to maintain positive head pressure
2. The condensing section shall be open on the sides and the bottom to provide access to allow air flow through the coils. Condenser coils shall be multi-row and fabricated from cast aluminum micro-channel coils. Each condenser coil shall be factory leak tested with high pressure air under water. Coils are to be recessed so that the cabinet provides built in hail protection.
3. Condenser fans shall be direct drive, propeller type designed for low tip speed, vertical air discharge, and include service guards. Fan blades shall be constructed of steel and riveted to a steel center hub. Condenser fan and motor shall heavy duty, inherently protected, three phase, non-reversing type with permanently lubricated ball bearing and integral rain shield.

F. SCROLL COMPRESSOR
1. Each unit shall have multiple, heavy-duty Copeland scroll compressors
2. Each compressor shall be complete with gauge ports, crankcase heater, sight glass, anti-slug protection, motor overload protection, and a time delay to prevent short cycling and simultaneous starting compressor following power failure.
3. Compressor shall be isolated with resilient rubber isolators to decrease noise transmission.

G. REFRIGERATION CIRCUIT
1. Each unit shall have two independent refrigeration circuits. Each circuit shall be complete with low pressure control, liquid line charging valve with 3/8” charging port, a manual reset high pressure safety switch. Each circuit shall be dehydrated and leak tested.

H. Hot gas bypass capped T shall be factory installed on the discharge line of the refrigerant circuit.

2.14 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.15 CONTROLS

A. Control equipment and sequence of operation are specified in Section 230900 "Instrumentation and Control for HVAC."

B. DDC Controller:

1. Controller shall have volatile-memory backup.
2. Safety Control Operation:

   a. Smoke Detectors: Stop fan and close outdoor-air damper if smoke is detected. Provide additional contacts for alarm interface to fire alarm control panel.
   b. Firestats: Stop fan and close outdoor-air damper if air greater than 130 deg. F enters unit. Provide additional contacts for alarm interface to fire alarm control panel.
   c. Fire Alarm Control Panel Interface: Provide control interface to coordinate with operating sequence described in Section 283111 "Digital, Addressable Fire-Alarm System" and Section 283112 "Zoned (DC Loop) Fire-Alarm System."

3. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.

4. Supply Fan Operation:

   a. Run fan continuously.

5. VVT Relays:

   a. Provide heating- and cooling-mode changeover relays compatible with VVT terminal control system required in Section 233600 "Air Terminal Units" and Section 230900 "Instrumentation and Control for HVAC."

C. Interface Requirements for HVAC Instrumentation and Control System:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
3. Provide BACnet compatible interface for central HVAC control workstation for the following:

   a. Adjusting set points.
   b. Monitoring supply fan start, stop, and operation.
   c. Inquiring data to include outdoor-air damper position, supply- and room-air temperature and humidity.

d. Monitoring occupied and unoccupied operations.
e. Monitoring constant and variable motor loads.
f. Monitoring variable-frequency drive operation.
g. Monitoring cooling load.
h. Monitoring economizer cycles.
i. Monitoring air-distribution static pressure and ventilation air volume. Static pressure sensor shall also be hard wired back to the AHU.

2.16 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

2.17 AIR HANDELING UNIT (AHU-3)

The unit shall be either configured at the factory (OAG) for Down/Horizontal discharge for Supply Openings. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be ETL listed and labeled, classified in accordance to UL 1995/CAN/CSA No. 236-M40 for Central Cooling Air Conditioners. Canadian units shall be CSA Certified.

2.18 Casing

Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 1000 hours in a salt spray test in compliance with ASTM B117. Unit shall have a 2 inch thick Antimicrobial Insulation. All insulation edges shall be either captured or sealed. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up.

2.19 Unit Top

The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and enhances water removal from unit top

2.20 Sensors

A factory installed combination outdoor air sensor located in the outdoor air hood is designed to sense both outdoor air temperature and relative humidity for use by the microprocessor controller to make required ventilation, cooling, dehumidification and heating decisions. Refer to the Sequence of Operations section of the Installation, Operation and Maintenance manual for detailed unit control and operational modes. A factory installed sensing tube is designed to sense the supply air temperature downstream of the indoor fan section.

2.21 Indoor Coil Type: DX 6-Row

Internally finned, inch copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The evaporator coil shall be leak tested to 500 psig and pressure tested to 500 psig. A Stainless Steel double-sloped condensate drain pan with provision for through the unit wall condensate drain is standard. Evaporator coil will have 6 interlaced rows for superior sensible and latent cooling.

2.22 Reheat: Fin & Tube Modulating HGRH

This option shall consist of a modulating hot-gas reheat coil located on the leaving air side of the evaporator coil pre-piped and circuited with a low pressure switch. Refer to the Sequence of Operations section of the Installation, Operation and Maintenance manual for detailed unit control and operational modes.

2.23 Compressor: Digital Scroll-1st Circuit Only

All units shall have direct-drive, hermetic, digital scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors. Crankcase heaters shall be included. Compressor shall be able to fully modulate from 20%-100%.

2.24 Outdoor Coil Type: Air Cooled Fin & Tube

(Fin and Tube Coil) - Internally finned, copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The condenser coil shall be leak tested to 500 psig and pressure tested to 500 psig. The condenser coil shall have a fin design with slight gaps for ease of cleaning.

Outdoor Fans: Shall be direct drive vertical discharge design with low-noise corrosion resistant glass reinforced polypropylene props, powder coated wire discharge guards and electro-plated motor mounting brackets. Fans shall be statically and dynamically balanced.

2.25 Heat Type - Primary: Electric - SCR Modulating

2.26 Primary heat is supplied using Electric Resistance heaters. Heaters shall meet the requirements of the National Electrical Code and shall be listed by Underwriters Laboratories for zero clearance to combustible surfaces and for use with heat pumps and air conditioning equipment. Heating elements shall be open coil, 80% nickel, 20% chromium, Type A resistance wire, Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine crimped into stainless steel terminals extending at least 1" into the air stream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets. Brackets are not to be spaced more than 4-1/2" apart. Heater frames and terminal boxes shall be corrosion resistant steel. Unless otherwise indicated, the terminal box shall be NEMA 1 construction and shall be provided with a hinged, latching cover. Open coil heaters shall be furnished with an airflow switch, disconnecting contactors, fuses (if over 48 amps), control circuit transformer (with primary fusing on Class I circuits as required), built-in, snap acting, door interlock disconnect switch, and a disk type, automatic reset thermal cutout for primary overtemperature protection. Heaters shall also be furnished with disk type, load-carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary

protection. Heat limiters or other fusible overtemperature devices are not acceptable. For modulating heaters, control will be SCR type. For staged heaters, 5kW capacity will be 2 stage and all heaters above 5kW will be 4 stage. If the unit is selected with horizontal discharge a NEMA 3R construction heater to be installed by the field in the supply duct of the unit will be provided in place of the standard NEMA 1 construction. NEMA 3R CONSTRUCTION - UL rain-tight Type 3R heaters are to provide protection against falling rain, sleet, external ice formation, and for indoor use for protection against dripping water. Unit shall be suitable for use with Electric Resistance Heat.

2.27 Evaporator Coil: DX 6 Row Interlaced

Internally finned, 5/16 inch copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The evaporator coil shall be leak tested to 500 psig and pressure tested to 500 psig. A Stainless Steel double-sloped condensate drain pan with provision for through the unit wall condensate drain is standard. Evaporator coil will have 6 interlaced rows for superior sensible and latent cooling.

2.28 Hot Gas Reheat: Modulating

This option shall consist of a modulating hot-gas reheat coil located on the leaving air side of the evaporator coil pre-piped and circuited with a low pressure switch. Refer to the Sequence of Operations section of the Installation, Operation and Maintenance manual for detailed unit control and operational modes.

2.29 Supply Fan Motor Type: Direct Drive w/VFD

Supply Fan motor shall be direct drive type with factory installed Variable Frequency Drive (unless no controls option is selected, VFD can be provided by others). All motors shall be thermally protected. All indoor fan motors meet the U.S. Energy Policy Act of 2005 (EPACT). All Fans shall be mounted on rubber vibration isolators, to reduce the transmission of noise.

2.30 Compressor: Digital Scroll Primary Circuit

All units shall have direct-drive, hermetic, digital scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors. Crankcase heaters shall be included. Compressor shall be able to fully modulate from 20%-100%.

2.31 Condenser: Air Cooled

(Fin and Tube Coil) - Internally finned, 5/16 inch copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The condenser coil shall be leak tested to 500 psig and pressure tested to 500 psig. The condenser coil shall have a fin design with slight gaps for ease of cleaning.

2.32 Outdoor Fans: Shall be direct drive vertical discharge design with low-noise corrosion resistant glass reinforced polypropylene props, powder coated wire discharge guards and electro-plated motor mounting brackets. Fans shall be statically and dynamically balanced.

2.33 Indoor Blower Motor: ECM w/ Backward Curved Plenum Fan Supply Fan shall be a high efficiency backward curved impeller. The supply motor shall be an electronic commuted motor with integrated power electronics.

2.34 Unit Controls: Discharge Air Control - UC600

2.35 Filter: MERV-13, 80%

Aluminum Mesh Filters (D, K and N Cabinets) and Galvanized Mesh Bird Screen (B and G Cabinets) shall be installed on the intake of the unit. In addition, one row of 2 inch MERV-13 shall be installed prior to the evaporator coil. Unit shall be equipped with a filter rack upstream of the evaporator. Frame shall be field-adjustable to match any filter combination specified in the attached selection.

2.36 AHU-2: 480-3V Electric Heater: 48 and AHU-3: 208-3V Electric Heater: 48

2.37 Heat Type - Primary: Electric - SCR Modulating- Primary- 48 KW

Primary heat is supplied using Electric Resistance heaters. Heaters shall meet the requirements of the National Electrical Code and shall be listed by Underwriters Laboratories for zero clearance to combustible surfaces and for use with heat pumps and air conditioning equipment. Heating elements shall be open coil, 80% nickel, 20% chromium, Type A resistance wire, Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine crimped into stainless steel terminals extending at least 1" into the air stream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets. Brackets are not to be spaced more than 4-1/2" apart. Heater frames and terminal boxes shall be corrosion resistant steel. Unless otherwise indicated, the terminal box shall be NEMA 1 construction and shall be provided with a hinged, latching cover. Open coil heaters shall be furnished with an airflow switch, disconnecting contactors, fuses (if over 48 amps), control circuit transformer (with primary fusing on Class I circuits as required), built-in, snap acting, door interlock disconnect switch, and a disk type, automatic reset thermal cutout for primary overtemperature protection. Heaters shall also be furnished with disk type, load-carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary protection. Heat limiters or other fusible overtemperature devices are not acceptable. For Modulating heaters, control will be SCR type. For staged heaters, 5kW capacity will be 2 stage and all heaters above 5kW will be 4 stage. If the unit is selected

with horizontal discharge a NEMA 3R construction heater to be installed by the field in the supply duct of the unit will be provided in place of the standard NEMA 1 construction. NEMA 3R CONSTRUCTION - UL rain-tight Type 3R heaters are to provide protection against falling rain, sleet, external ice formation, and for indoor use for protection against dripping water. Unit shall be suitable for use with Electric Resistance Heat.

2.38 Unit Controls: Trane UC600 - Discharge Air Control w/BACNET w/Display

Unit is completely factory wired with necessary controls and contactor pressure lugs for power wiring. Units will provide an external location for mounting fused disconnect device. Micro-processor controls are provided for all 24 volt control functions. The resident control algorithms will make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring outdoor temperature and humidity as well as indoor temperature. The control algorithm maintains accurate temperature control, minimizes drift from set point and provides better building comfort. A centralized micro-processor (OACM) will provide anti-short cycle timing for a higher level of machine protection. Terminals are provided for a field installed dry contact or switch closure to put the unit in the Occupied or Unoccupied modes.

2.39 Damper Options: 100% OA 2-Position Damper

The unit shall have a factory installed and integrated 100% outdoor air hood with damper controlled a by direct coupled actuator and 2 inch permanent and washable aluminum mesh filters accessible through a hinged access panel. The return air damper tray is blocked off to allow 100% outdoor airflow.

2.40 Electrical Options: Non-Fused Disconnect Switch (B/G)

A 3-pole, molded case, HACR circuit breaker with provisions for through the base electrical connections shall be installed. The disconnect switch will be installed in the unit in a water tight enclosure. Wiring will be provided from the switch to the unit high voltage terminal block. The switch will be UL/CSA agency recognized. The disconnect switch will be sized per NEC and UL guidelines but will not be used in place of unit overcurrent protection. Factory wired Voltage/Phase monitor shall be included as standard. In the event of any of the following, the units will be shut down and a fault code will be stored in the monitor for the most recent 25 faults. Upon correction of the fault condition the unit will reset and restart automatically.

I. Phase Unbalance Protection: Factory set 2%
II. Over/Under/Brown Out Voltage Protection: +/-10% of nameplate voltage
III. Phase Loss/Reversal

2.41 Air Flow Monitoring: IFM Fan Piezo Ring/Tap

Air flow measurement will be accomplished through the use of Piezo Ring or Tap technology installed in the supply fan wheel area.

2.42 Accessories: Condenser Hailguard

Hail guards shall be installed on the outside of the condenser coil. The guards shall consist of perforated metal, of the same gauge and color as the unit itself. Airflow through the hail guards shall not be restricted due to location or size of the perforations. Guards shall be removable to accommodate coil cleaning.

2.43 Supply Fan Motor Type: Direct Drive w/VFD

Supply Fan motor shall be direct drive type with factory installed Variable Frequency Drive. All motors shall be thermally protected. All indoor fan motors meet the U.S. Energy Policy Act of 2005 (EPACT). All Fans shall be mounted on rubber vibration isolators, to reduce the transmission of noise.

2.44 Smoke Detector: Supply Smoke Detector
Smoke detector shall be factory installed photoelectric smoke detector mounted in the supply air section. The detector will be wired for continuous power whenever the unit is energized. Upon detection of smoke, the detector will shut down all unit operations. Local codes may dictate the location of detectors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of AHUs.

B. Examine roughing-in for AHUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where AHUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Unit Support: Install unit level on structural members. Coordinate wall penetrations and flashing with wall construction. Secure AHUs to structural support with anchor bolts.

3.3 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

B. Install piping adjacent to AHUs to allow service and maintenance.

C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to AHUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. 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. Report results in writing.

C. Tests and Inspections:

1. After installing AHUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 START-UP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup check according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Remove packing from vibration isolators.
11. Inspect operation of barometric relief dampers.
12. Verify lubrication on fan and motor bearings.
13. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
14. Adjust fan belts to proper alignment and tension.
15. Inspect and record performance of interlocks and protective devices; verify sequences.
16. Operate unit for an initial period as recommended or required by manufacturer.
17. Calibrate thermostats.
18. Adjust and inspect high-temperature limits.
19. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
20. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
21. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation, testing and adjusting, AHU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain AHUs.

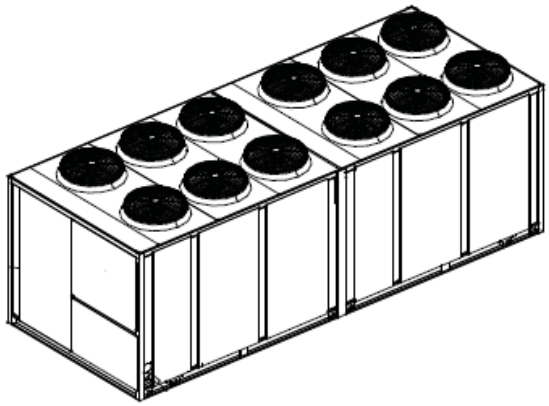
END OF SECTION 237413

Unit Overview

Unit Type	Nominal Capacity	Minimum Installed Weight	Maximum Installed Weight	Total Power (Condenser Only)	Elevation
Condensing unit - Air cooled	80 tons	5050.0 lb	5783.0 lb	102.04 kW	0.00 ft

Unit Features

System Control	No system control
Isolator Option	Spring isolators (unit)
Agency Approval	cULus



Unit Electrical

Voltage/Phase/Hz	460/60/3	**MCA**	174.00 A
		MOP	200.00 A
		RDE	175.00 A

Condenser FLA	1.80 A
Condenser Motor Count	8.00 Each
Condenser Fan Motor Power	7.04 kW

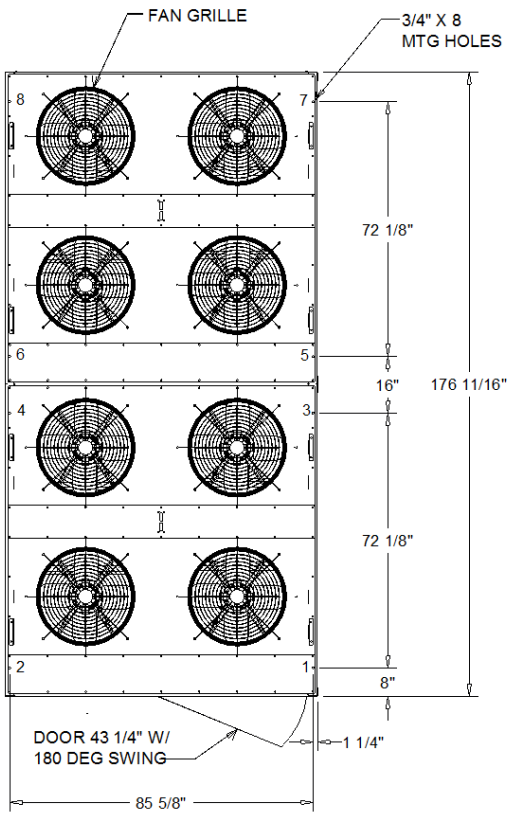
Compressor 1 RLA	25.40 A
Compressor 1 Count	6.00 Each
Compressor 2 RLA	0.00 A
Compressor 2 Count	0.00 Each
Compressor Power	95.00 kW

Condensing Section

Service Valves	Suction service valves	**Application Type**	Standalone RAUJ Condenser
Refrigerant Type	R410a	**Net Total Capacity**	1121.31 MBh
Design Ambient Temp	95.00 F	**Saturated Suction Temp**	45.00 F
Ambient Control	Low ambient dampers	**Leaving Compressor Temp**	127.22 F
EER @ AHRI	11.0 EER	**Entering Expansion Device Temp**	108.09 F

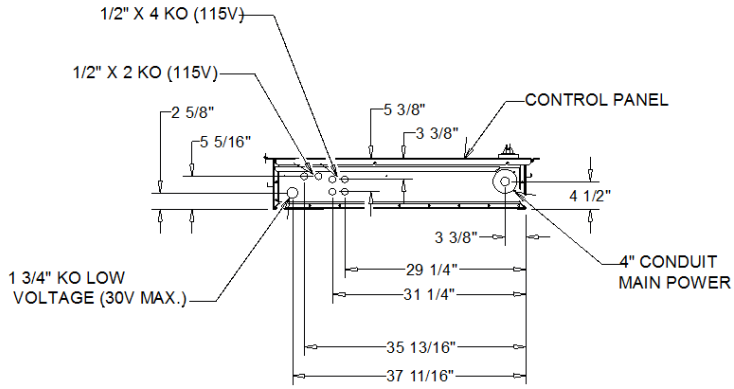
Refrigerant Line Information

Suction Line Size - Horizontal	2-1/8 in.
Suction Line Size - Vertical	2-1/8 in.
Liquid Line Size	1-1/8 in.



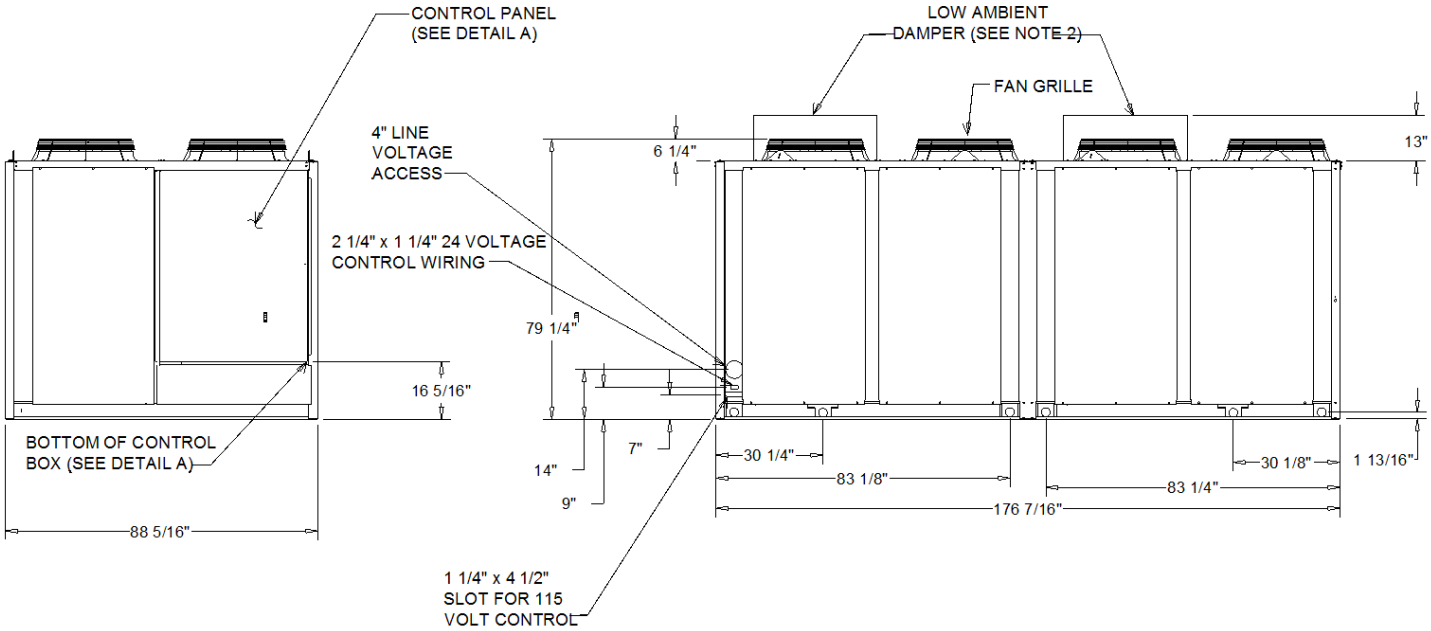
NOTES:

1. SEE CONNECTION DRAWING FOR CONNECTION LOCATION AND SIZES.
2. LOW AMBIENT DAMPER ONLY COMES WITH SELECTED UNIT .



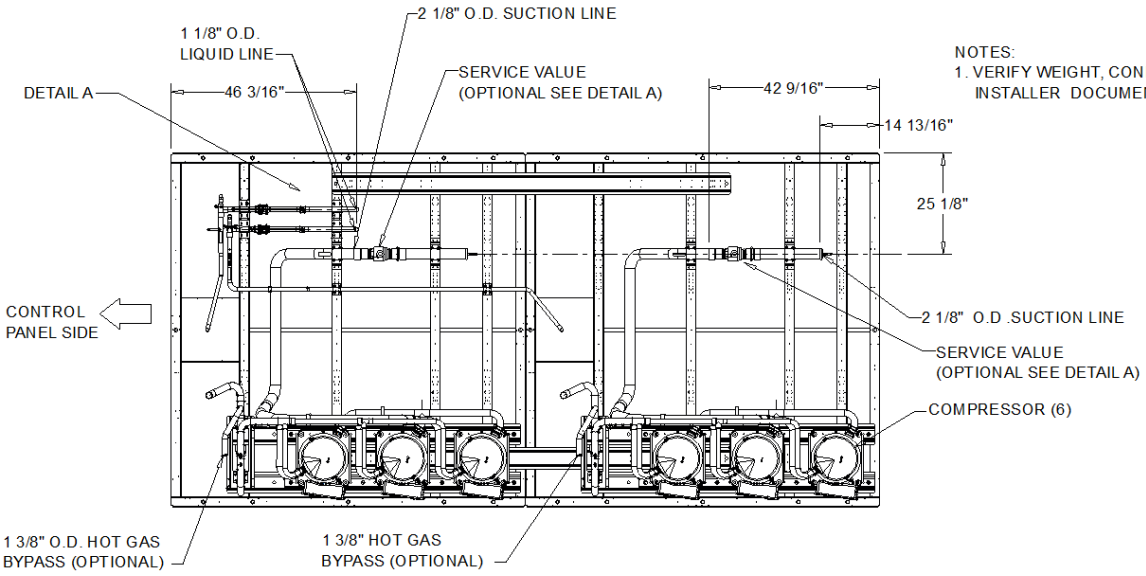
DETAIL A

DIMENSIONAL DETAIL



80 TON UNIT

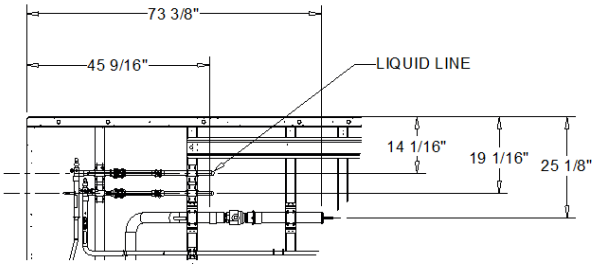
DIMENSIONAL DRAWING



NOTES:
1. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH INSTALLER DOCUMENTS BEFORE INSTALLATION

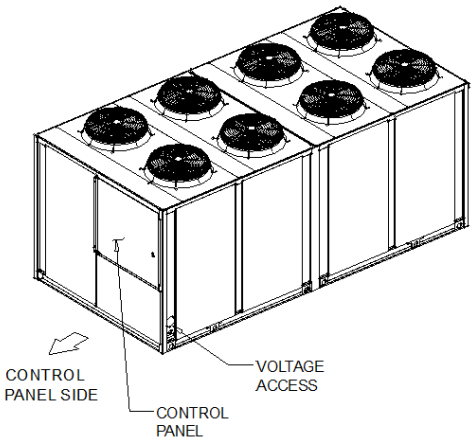
PLAN VIEW OF UNIT

CONNECTION DRAWING



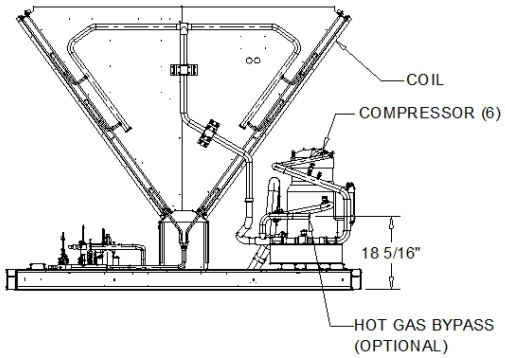
DETAIL A

DETAIL DRAWING



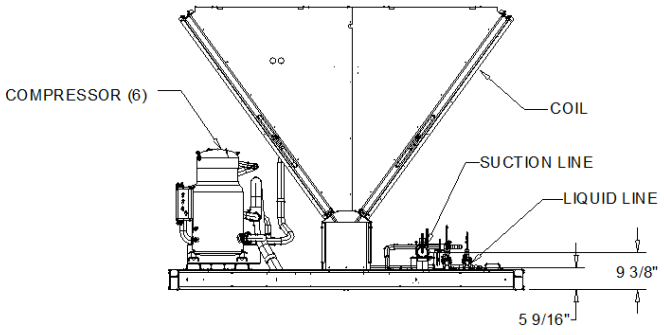
ORIENTATION VIEW OF UNIT

ISOMETRIC DRAWING



LEFT VIEW OF UNIT

CONNECTION DRAWING



CONTROL PANEL SIDE VIEW OF UNIT

CONNECTION DRAWING

80 TON UNIT

DIMENSIONAL CONNECTION DRAWING

GENERAL ELECTRICAL DATA

GENERAL

Tonnage / kW:	80
Unit Operating Voltage Range:	180-220
Unit Primary Voltage:	200
Unit Hertz:	60
Unit Phase:	3
Minimum Circuit Ampacity: (3)	411.00
Maximum Overcurrent Protection Device: (2)	450.00
Recommended Dual Element Fuse: (4)	450.00

OUTDOOR MOTOR

Number:	8
Horsepower:	1.0
Motor Speed (rpm):	1,140
Outdoor Motor Full Load amps:	4.1
Outdoor Motor Locked Rotor amps:	20.7

COMPRESSOR

	Circuit A1/A2 - Circuit B1/B2 - Circuit C1/C2
Tons (ea):	15.0/15.0 - 15.0/15.0 - 15.0/15.0
Compressor Rated Load Amps (ea):	60.5/60.5 - 60.5/60.5 - 60.5/60.5
Locked Rotor Amps (ea):	320.0/320.0 - 320.0/320.0 - 320.0/320.0

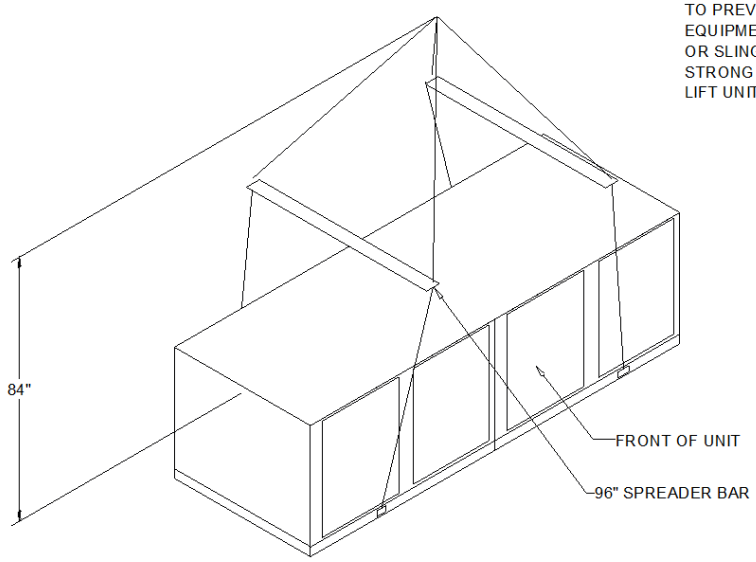
REFRIGERANT OPERATING CHARGRE (Cond Only, per Circuit)

Type:	R-410A
Number of Circuits:	2
Condenser Storage Capacity:	47.1 lb
Refrigerant Operating Charge (Condensert Only):	57.1 lb

Notes:

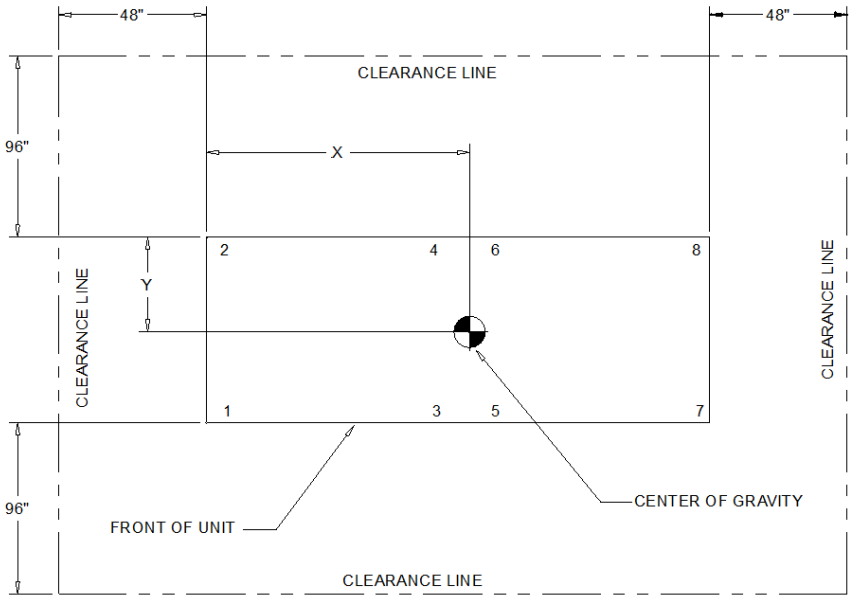
1. Electrical data is for each individual motor.
2. Maximum overcurrent protection permitted by nec 440-22 is 225 percent of largest compressor motor rla plus the remaining motor rla and fla values.
3. Minimum circuit ampacity is 125 percent of the largest compressor motor rla plus the remaining motor rla and fla values.
4. Recommended dual element fuse size is 150 percent of the largest compressor motor rla plus the remaining motor rla and fla values.
5. Local codes may take precedence.
6. Electrical data is pulled from TOPSS (performance engine). If data is missing please check TOPSS.

WARNING
TO PREVENT INJURY OR DEATH AND POSSIBLE EQUIPMENT DAMAGE, DO NOT USE CHAIN (CABLES) OR SLINGS EXCEPT AS SHOWN AND USE CABLES STRONG ENOUGH TO SUPPORT UNIT WEIGHT. TEST LIFT UNIT TO ENSURE PROPER BALANCE AND RIGGING.



80 - 120 RIGGING

WEIGHT AND RIGGING



WARNING!
TO PREVENT INJURY OR DEATH AND POSSIBLE EQUIPMENT DAMAGE, DO NOT USE CHAIN (CABLES) OR SLINGS EXCEPT AS SHOWN AND USE CABLES STRONG ENOUGH TO SUPPORT UNIT WEIGHT. TEST LIFT UNIT TO ENSURE PROPER BALANCE AND RIGGING.

WEIGHTS AND LOAD POINTS

TONNAGE:	80
SHIPPING:	4870.0 lb
OPERATING:	4940.0 lb
LOAD POINTS 1 :	798.3 lb
LOAD POINTS 2 :	462.1 lb
LOAD POINTS 3 :	786.7 lb
LOAD POINTS 4 :	450.5 lb
LOAD POINTS 5 :	785.1 lb
LOAD POINTS 6 :	448.9 lb
LOAD POINTS 7 :	772.4 lb
LOAD POINTS 8 :	436.1 lb

*ALL WEIGHTS ARE APPROXIMATE

CENTER OF GRAVITY

X:	86"
Y:	55 13/16"

ADD WEIGHTS

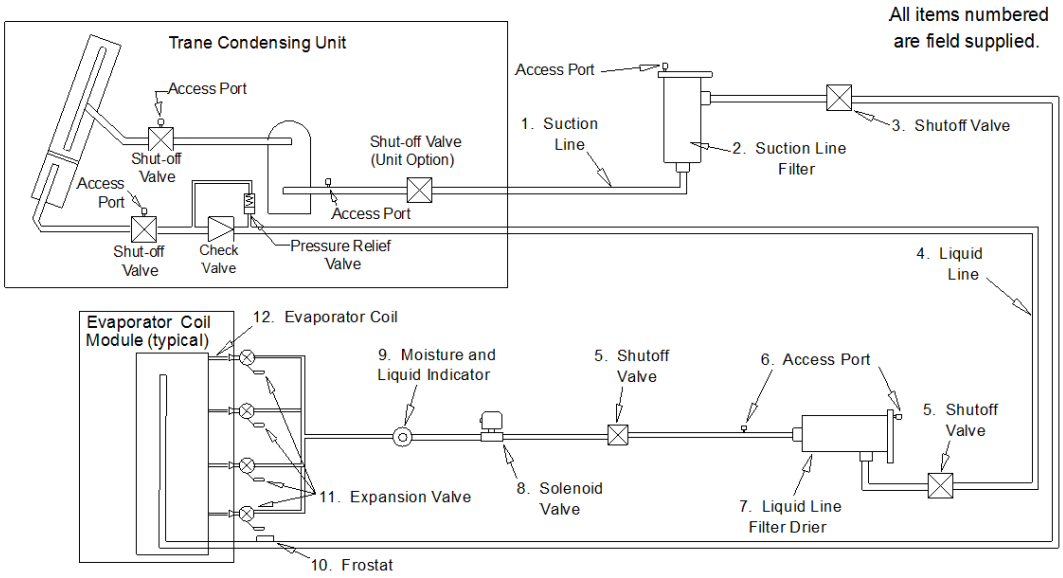
TO SHIPPING WEIGHT: (4)
TO OPERATING WEIGHT: (4)

NOTES:
1. OPERATING WEIGHT INCLUDES REFRIGERANT, OIL AND WATER.
2. SHIPPING WEIGHT INCLUDES REFRIGERANT AND OIL CHARGES
3. THE ACTUAL WEIGHT IS SHOWN ON THE NAMEPLATE. WEIGHT SHOWN REPRESENT TYPICAL SHIPPING AND OPERATING WEIGHTS FOR THE UNIT SELECTED.
4. ADD WEIGHT TO TOTAL WEIGHT OF UNIT
5. IF UNITS IS INSTALLED IN A WELL, THE DEPTH OF THE WELL MUST NOT EXCEED THE TOP HEIGHT OF THE UNIT. THE TOP OF THE UNIT MUST HAVE UNRESTRICTED AIRFLOW. PLEASE REFERENCE RECOMMENDED CLEARANCES.

80 - 120 TON CENTER OF GRAVITY AND CLEARANCES

WEIGHT AND RIGGING

Required Components for One of Two Identical Refrigerant Circuits



Suction Line

1. Interconnected Tubing (Suction line) - 80 ton 2 1/8" O.D. and 100-120 ton 2 5/8" O.D. Horizontal.
   2 1/8" O.D. Vertical - maximum of 50 feet if condenser is above evaporator (If risers are more than 50 feet, the application must be reviewed by Trane)

2. Suction Line - Filter Drier 1/ckt suction filter should be the replaceable-core type, and a clean core should be installed after the system is cleaned up.

3. Shut-Off Valve 2 - Manual ball valves.

LIQUID LINE

4. Interconnected Tubing (Liquid Line) - 1 1/8" O.D. Horizontal
   1 1/8" O.D. Vertical - Refer to applications guide SS-APG012 - EN for vertical & horizontal piping limitations.

5. Shut-Off Valve - 2 Manual ball valves for 625" tubing

6. Access Port - Port used to determine suction pressure. This port is usually a Schraeder valve with a core.

7. Liquid Line - Filter Drier 1/ckt liquid filter should be the replaceable-core type, and a clean core should be installed after the system is cleaned up.

8. Solenoid Valves - Liquid line requires a field supplied and installed isolation solenoid valve within 10 feet of the evaporator. The suggested solenoid uses a 120-volt service and requires code-compliant wiring to the RAUJ condensing unit.
   Note: Trim solenoids cannot be used. They are not compatible with Microchannel condenser coils.

9. Moisture and Liquid Indicator - One moisture-indicating sight glass is to be installed in the main liquid line

10. Frostat (Not Required) - The control is mechanically attached to the outside of the refrigerant line, near the evaporator, and wired to the unit control panel. See application guide SS-APG012 - EN for selection information.

11. Expansion Valves - See application guide SS-APG012-EN for selecting quantity and size.
Note: Units with Microchannel condenser coils applied with DX systems will require 30 percent bleed valves for the 20-60T units and 15 percent bleed valves for the 80-120T (shown below). Those with BPHE can use standard non-bleed valves referenced in SS-APG012-EN.

Expansion Valves for 80-120T MCHE (15 Percent Bleed)

REFRIGERANT	MANUFACTURER	MIN.	MAX.	MODEL NUMBER	TRANE PART
R-410A	SPORLSN	2.0	2.5	ERZE-1-1/2-ZGA (BP/15)	N/A
R-410A	SPORLSN	2.5	3.0	ERZE-2-ZGA (BP/15)	N/A
R-410A	SPORLSN	3.0	4.5	ERZE-3-ZGA (BP/15)	N/A
R-410A	SPORLSN	4.0	6.0	ERZE-4-ZGA (BP/15)	N/A
R-410A	SPORLSN	5.0	7.5	ERZE-5-ZGA (BP/15)	VAL10579
R-410A	SPORLSN	6.0	9.0	ERZE-6-ZGA (BP/15)	VAL10580
R-410A	SPORLSN	7.0	12.0	ERZE-8-ZGA (BP/15)	VAL10581
R-410A	SPORLSN	9.5	15.5	ERZE-12-1/2-ZGA (BP/15)	VAL10582
R-410A	SPORLSN	12.5	19.0	ERIZE-15-ZGA (BP/15)	VAL10583
R-410A	SPORLSN	15.0	25.0	OZE-20-ZGA (BP/15)	VAL10584
R-410A	SPORLSN	19.5	30.0	OZE-25-ZGA (BP/15)	VAL10585
R-410A	SPORLSN	23.5	45.0	OZE-35-ZGA (BP/15)	VAL10586
R-410A	SPORLSN	35.0	68.0	OZE-50-ZGA (BP/15)	VAL10587
R-410A	SPORLSN	52.5	70.0	OZE-60-ZGA (BP/15)	VAL10588

(1) Ton per distributor, choose the valve that matches the evap coil circuit capacity that it serves.
(2) Provide and install one expansion valve per distributor.

Refrigerant Charge and Maximum Line Length

Total interconnecting line length (per circuit)	50 ft	100 ft	150 ft
Condenser and line set approx. refrigerant charge (per circuit) - evaporator charge not included	N/A	N/A	N/A

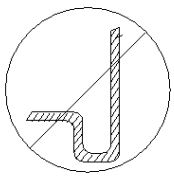
If total interconnecting line length is more than 150 ft, the application must be reviewed by Trane.

**Contact product support for information on refrigeration components and piping application assistance.
***Data in table is pulled from TOPSS selection. If N/A is present, please refer to unit IOM.

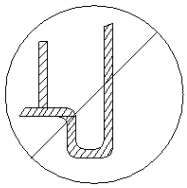
Installation Guidelines

Suction Line Piping

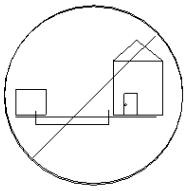
1. Do not use suction line traps.



2. Do not use double risers.



3. Avoid putting suction lines underground.

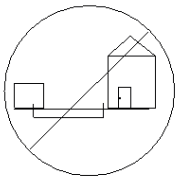


4. Route suction lines as short and direct as possible.
5. Slope suction line away from the condensing unit 1" for every 10 ft.
6. Insulate suction line.
7. The suction filter should be located as close to the compressors as possible.

Required Components for One of Two Identical Refrigerant Circuits Continued

Liquid Line Piping

1. Avoid putting liquid lines underground.

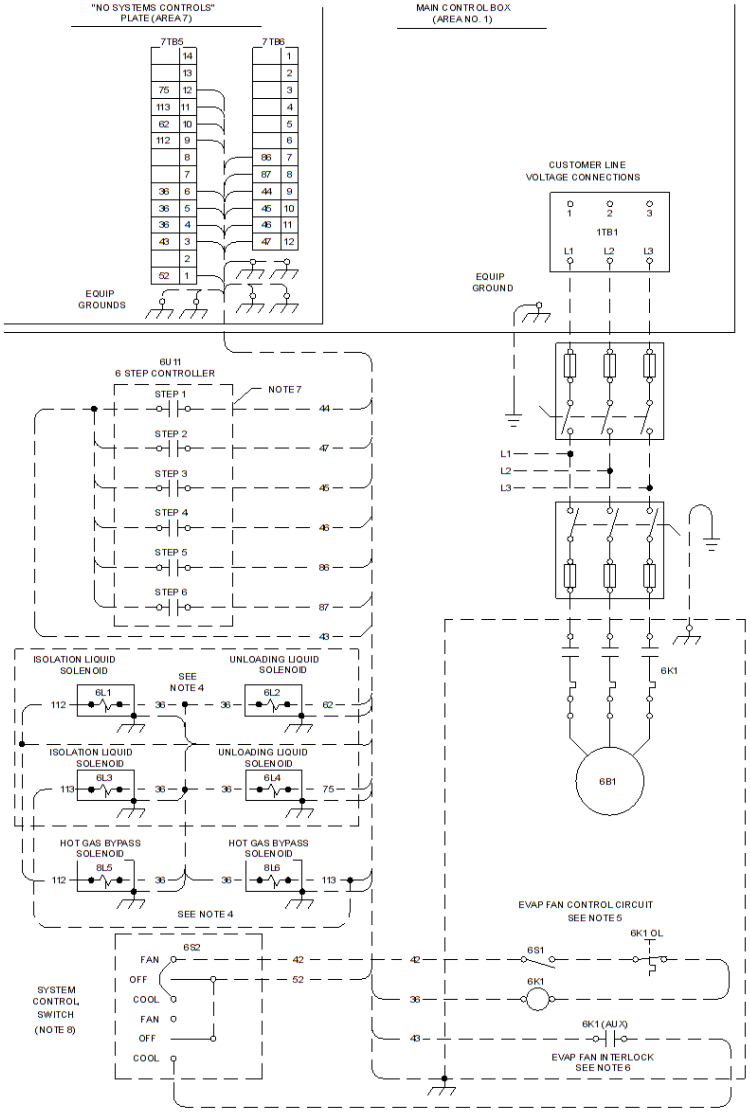


2. Route liquid lines as short and direct as possible.
3. Slope liquid line away from the condensing unit 1" for every 10 ft.
4. Only insulate liquid lines that pass through heated areas.
5. Wire solenoid valve per field connection diagram
6. The liquid line filter drier should be as close to the solenoid valve as possible.

Evaporator Piping

1. Install TXV directly to unit liquid connection.
2. Locate TXV bulb midway between 90F bends on top of suction tube as shown.
3. Secure bulb to tube with the two clamps provided by the manufacturer and insulate bulb.
4. Install the TXV equalizer line close to & downstream of the bulb, on top of the horizontal suction line.
5. Install frostat per kit instructions on the suction line as close to the evaporator as possible.

See SS-APG012-EN for proper DX evaporator piping details.



CUSTOMER WIRE SELECTION TABLE			
POWER WIRE SELECTION TO MAIN TERMINAL BLOCK (1TB1)			
TERMINAL BLOCK SIZE			CONNECTOR WIRE RANGE
760 AMP			(2) #4 -- 500 MCM
CONTROL WIRE SELECTION			
WIRE GUAGE	OHMS PER	12000"	MAX WIRE LENGTH
18 AWG	8		6000"
16 AWG	5		12000"
14 AWG	3		24000"
12 AWG	2		36000"
SHIELDED WIRE TABLE			
WIRE GUAGE			MAX WIRE LENGTH
16 AWG			6000"
14 AWG			12000"

NOTES:

1. All wiring and components shown dashed to be supplied and installed by customer in accordance\n with loc
2. All wiring to be N.E.C. class 1 unless otherwise specified.
3. CAUTION - Do not run low voltage wire (30 volts maximum) in conduit or raceway with\n higher voltage wir
4. Maximum solenoid ratings are 72 VA inrush/30 VA sealed.
5. Maximum ratings are 240 VA inrush/40 VA sealed.
6. Minimum ratings are 250 VA inrush/125 VA sealed.
7. 6 step controller minimum ratings are - N. O. contacts = 150 VA inrush/75 VA sealed;\n N. C. contacts = 80
8. Suggested system control switch (6S2) is Cutler Hammer 7562k5 2pdt toggle switch or equivalent.

⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.

FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

⚠ AVERTISSEMENT

VOLTAGE HASARDEUX!

DECONNECTEZ TOUTES LES SOURCES ELECTRIQUES INCLUANT LES DISJONCTEURS SITUES A DISTANCE AVANT D'EFFECTUER L'ENTRETIEN.

FAUTE DE DECONNECTER LA SOURCE ELECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN PEUT ENTRAINER DES BLESSURES CORPORELLES SEVERES OU LA MORT.

⚠ CAUTION

USE COPPER CONDUCTORS ONLY! UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

IMPORTANT!

DO NOT ENERGIZE UNIT UNTIL CHECK-OUT AND START-UP PROCEDURE HAS BEEN COMPLETED

TRANE

Job Name: Remsen Hall
Prepared By:

Unit Tag: RAUC80-1
Quantity: 1

General - R410
All air-cooled condensing units shall have scroll compressors and are factory assembled and wired. Each unit shall ship from the factory with a nitrogen holding charge. Units shall be constructed of 14-gauge welded galvanized steel frame with 14 and 16-gauge galvanized steel panels and access doors. Unit surface shall be phosphatized and finished with an air-dry paint. Air-dry paint finish shall withstand a minimum of 625-consecutive-hour salt spray application in accordance with standard ASTM B117.

Compressor - R-410A
Trane 3-D Scroll compressors have simple mechanical design with only three (3) major moving parts. Scroll type compression provides inherently low vibration. 3-D compressors provide a completely enclosed compression chamber with no leakage paths. The compressor is suction gas cooled, direct drive, 3600 RPM hermetic motors. The Scroll compressor includes a centrifugal oil pump, oil level sight glass, and an oil charging valve.

Refrigerant Management - R-410A
Split systems can have significantly more refrigerant than packaged systems and thus require controls to reliably manage this excess refrigerant. Each compressor shall have crankcase heaters installed, properly sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles. Additionally, the condensing unit shall have controls to initiate a refrigerant pump down cycle at system shut down on each refrigerant circuit. To be operational, the refrigerant pump down cycle requires a field-installed isolation solenoid valve on the liquid line near the evaporator.

Note:
Under extreme conditions, R410a refrigerant can present special challenges with piping and system design. Whenever refrigerant line set lengths approach 150 equivalent feet and/or design ambient temperature exceeds 115 degrees F, contact your Trane Account Executive to review application requirements.

Condenser Fan and Motors - R-410A
Vertical discharge direct-drive fans are statically and dynamically balanced. Fan motors are three-phase with permanently lubricated ball bearings, built-in current and thermal overload protection.

Microchannel Condenser Coil -l R410A
Condenser coils are dual circuit having an all Aluminum Microchannel design. The coils are burst tested and leak tested. Factory installed liquid line service valves are standard.

Refrigerant Circuit - R410A
Each unit has two independent refrigeration circuits with 3 compressors per circuit piped in parallel. Six step capacity control is accomplished through compressor cycling.

Unit Control - R410A
Factory-provided 115-volt control circuit includes fusing and control power transformer. The unit is wired with magnetic contactors for compressor and condenser motors. Three-leg circuit breakers are used for overload and short circuit protections. The unit also has high/low pressure cutouts. Charge isolation, reset relay and anti-recycle compressor timer is provided. Across- the- line start is standard.

No System Control - R410A
No System Control provides a terminal strip for step control provided by others. The system provides internal 3 minute fixed on and 5 minute fixed off time delays and compressor contactors. The system temperature ¿step¿ controller must be field provided and installed.

Note:
For No Controls units with system temperature ¿step¿ controllers provided by others, the controller must include 5 minute on/off interstage timers to coordinate with the units fixed on/off time delay relays.

Low Ambient Control - R410A
Low ambient option extends unit operation from 40 F to 0 F [4.5 to -17.8 C] by utilizing an external damper assembly for head pressure control.

Spring Isolators - R410A
Steel spring vibration isolators are supplied, for field installation under the unit, to reduce transmission of vibration to building structure and adjacent areas.

Suction Service Valves - R410A
This valve is provided in order to isolate the compressor for servicing. This valve is a refrigerant shut off valve.

Field Installed; 15% Bleed Valve TXV
Installation shall require use of 15% bleed, Thermal Expansion Valves. Valves shall be field supplied and field installed. Quantity and size shall be determined by the application.

Note: Liquid line solenoids are required for all applications. Trim solenoids cannot be used.

Trane Performance Climate Changer Air Handler

Unit Overview - ST-DX-ST-H

Application	Calculated Unit Size	External Dimensions			Weight	
		Height	Width	Length	Installed	Rigging
Outdoor unit	29	72.4 in	90.0 in	253.5 in	7690 lb	7294 lb

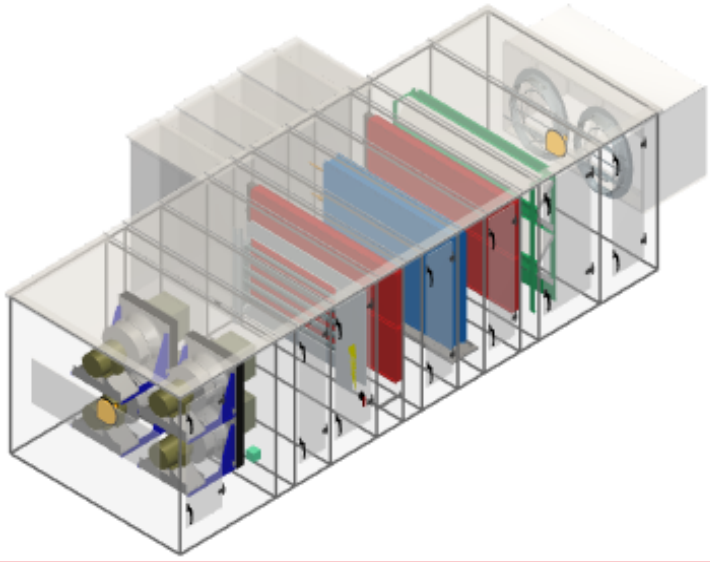
Quantity of Shipping Sections	Largest Ship Split			Heaviest Ship Split	Elevation
	Height	Width	Length		
1 piece	72.5 in	90.0 in	253.3 in	7294 lb	0.00 ft

Supply Fan			
Airflow	12000 cfm	Total Static Pressure	5.192 in H2O

Note: The unit's height includes the outdoor roof.

Construction Features

Panel	3" - R19 Casing
Panel Material	All unit inner panels - galvanized
Integral Base Frame	7.25 in. integral base frame
Paint	Slate gray
Agency Approval	YES



Unit Electrical

Circuit	Voltage/Phase/Frequency	FLA	MCA	Fuse Size
Circuit number 1 Supply fan motor(s)	460/3/60	32.80 A	34.85 A	40.00 A

Warranty

Warranty section	Std. warranty only

Mixing section - Position: 1

Openings							
Face	Path	Type	Airflow	Face Velocity	Opening Dimensions	Pressure Drop	Hood
Back	Outside	Std TRAQ	12000 cfm	1910 ft/min	62.300 in x 35.660 in	0.305 in H2O	Inlet

Section Options	
Section Length	30.450
Door Location	Right

Filter section - Position: 2

Primary Filter									
Type	Frame	Loading	Airflow	Face Area	Face Velocity	Condition	Pressure Drop	Filter Quantity	Filter Size
Pleated media - MERV 13	2" angled	Side load filters	12000 cfm	46.67 sq ft	257 ft/min	Mid-life	0.585 in H2O	12.00 4.00	20in.x20in. 24in.x20in.

Filter Section Options	
Door Location	Right

Heating coil section - Position: 3

Coil Construction	
Model	Steam - NS
Rows	1
Tube Diameter	1in. tube diameter (25.4 mm)
Tube Matl/Wall Thickness	.031" (0.787mm) copper tubes
Fin Spacing	51 Per Foot
Fin Material	Aluminum fins
Fin Type	Sigma flo fins
Face Area	25.33 sq ft
Coil (top/single) H x L	24 in. (610 mm) X 76" (2057 mm) finned length
Coil (middle/bottom) H x L	24 in. (610 mm) X 76" (2057 mm) finned length
Casing	Galvanized
Rigging Weight	201.4 lb
Coil Section Options	
Extended Drain and Vent	Holes only
Service Panel	Standard panels

Coil Performance	
Capacity	
Total	650.70 MBh
Air	
Flow	12000 cfm
Entering Dry Bulb	0.00 F
Leaving Dry Bulb	50.00 F
Pressure Drop	0.089 in H2O
Face Velocity	474 ft/min
Steam	
Inlet Pressure	5.00 psig
Pressure Drop	8.581 in H2O
Coil Condensate	676.64 lb/hr
AHRI 410 Classification	
AHRI 410 Classification	AHRI ACHC Certified
Data Generation Date	7/15/2019
TOPSS update number	2260

Note: Certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table 1 of the Standard. Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Access / Turning section (door optional) - Position: 4

Section Options	
Section Length	19.000
Door Location	Right

Cooling coil section - Position: 5

Coil Construction	
Model	Refrigerant - UF
Rows	6
Tube Diameter	1/2in. tube diameter (12.7 mm)
Tube Matl/Wall Thickness	Internally enhanced copper tubes
Fin Spacing	98 Per Foot
Fin Material	Aluminum fins
Fin Type	Delta flo H (Hi efficient)
Face Area	27.05 sq ft
Coil (top/single) H x L	51 in. (1295 mm) X 76" (2057 mm) finned length
Casing	Galvanized
Rigging Weight	353.4 lb
Coil Section Options	
Extended Drain and Vent	No
Service Panel	Standard panels

Coil Performance	
Capacity	
Total	886.92 MBh
Sensible	487.46 MBh
Air	
Flow	12000 cfm
Entering Dry Bulb	92.00 F
Entering Wet Bulb	76.00 F
Leaving Dry Bulb	55.00 F
Leaving Wet Bulb	54.58 F
Pressure Drop	0.644 in H2O
Face Velocity	444 ft/min
Refrigerant	
Type	R-410A
Liquid Temperature	115.00 F
Suction Temperature	45.00 F
Circuiting Type	Intertwined circuits
Capacity Circuits	Full circuiting
AHRI 410 Classification	
AHRI 410 Classification	AHRI ACHC Certified
Data Generation Date	7/15/2019
TOPSS update number	2260

Note: Certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table 1 of the Standard. Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Access / Turning section (door optional) - Position: 6

Section Options	
Section Length	19.000
Door Location	Right

Heating coil section - Position: 7

Coil Construction	
Model	Steam - NS
Rows	1
Tube Diameter	1in. tube diameter (25.4 mm)
Tube Matl/Wall Thickness	.031" (0.787mm) copper tubes
Fin Spacing	58 Per Foot
Fin Material	Aluminum fins
Fin Type	Sigma flo fins
Face Area	25.33 sq ft
Coil (top/single) H x L	24 in. (610 mm) X 76" (2057 mm) finned length
Coil (middle/bottom) H x L	24 in. (610 mm) X 76" (2057 mm) finned length
Casing	Galvanized
Rigging Weight	207.4 lb
Coil Section Options	
Extended Drain and Vent	Holes only
Service Panel	Standard panels

Coil Performance	
Capacity	
Total	585.63 MBh
Air	
Flow	12000 cfm
Entering Dry Bulb	50.00 F
Leaving Dry Bulb	95.00 F
Pressure Drop	0.106 in H2O
Face Velocity	474 ft/min
Steam	
Inlet Pressure	5.00 psig
Pressure Drop	6.920 in H2O
Coil Condensate	609.08 lb/hr
AHRI 410 Classification	
AHRI 410 Classification	AHRI ACHC Certified
Data Generation Date	7/15/2019
TOPSS update number	2260

Note: Certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table 1 of the Standard. Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Humidifier section - Position: 8

Construction	
Steam Source	Building steam
Steam Pressure	5.00 psig
Connection Location	Left
Required Orifice Size	3/4"
Valve Pipe Connection Size	1 1/2"
Options	
Drain Connection/Material	Galvanized drain pan
Drain Connection	Left
Service Panel	Standard panels

Performance	
Airflow	12000 cfm
Entering Dry Bulb	78.00 F
Entering Relative Humidity	25.00 %
Leaving Relative Humidity	50.00 %
Steam Rate	286.97 lb/hr
Air Temperature Gain	1.40 F
Condensation Loss	19.16 lb/hr

VFD only - Position: 9

Supply Fan Motor Interface Door	Supply high volt. door - right

Access / Turning section (door optional) - Position: 10

Section Options	
Section Length	19.000
Door Location	Right

Blank (0 to 14in) - Position: 11

Section Options	
Section Length	10.000

Supply fan section - Position: 12

Fan Data	
Wheel Diameter/Type/Class	15in. dd plenum, full width, M press
Fan Quantity	4
Motor Location	Right side drive
Blades	Improved sound(lowest overall,less spike
Drive Service Factor	Improved sound(lowest overall,less spike

Fan Performance	
Airflow	12000 cfm
Total Static Pressure	5.192 in H2O
Total Brake Power	16.042 hp
Operating Speed	2949 rpm
AMCA FEG	FEG71
Unit Static Efficiency	61.22 %
Redundancy	95.48 %

Motor Interface Options	
Selection Type	VFD per fan
Voltage	460/3
Mounting Location	Internal mounting
Motor Wire In Conduit	No conduit
VFD Frequency	100.00 Hz

Motor Data	
Power / Fan	5 hp
Voltage	460/3
Speed	1800
Class	NEMA premium compliant ODP
Efficiency	90.05 %
Part Load Efficiency	85.83 %

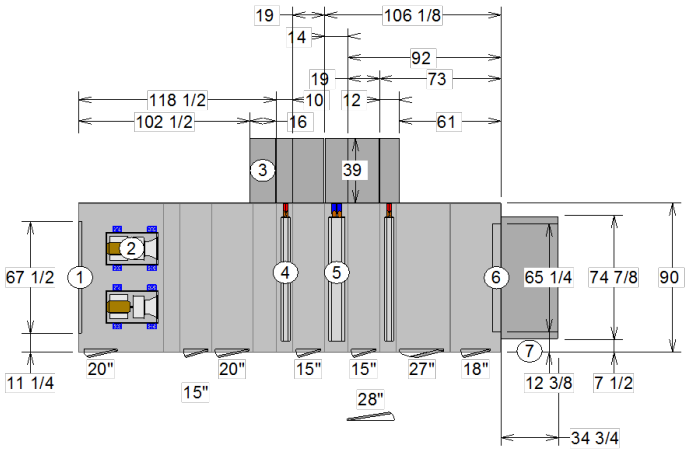
Fan Section Options	
Backdraft Dampers	YES
Fan wheel Balance	Inverter balance with shaft grounding
Door Location	Right
Door Guard	Yes
Protective Grate	No
Coplanar Separation	No

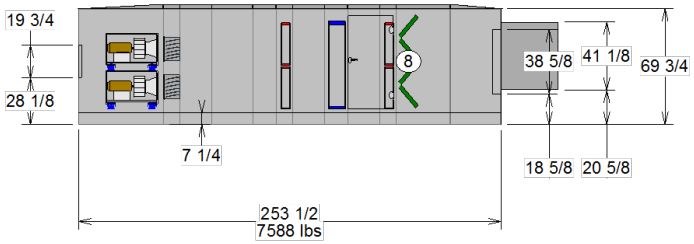
Fan Discharge Options

Face	Type	Airflow	Face Velocity	Opening Dimensions	Pressure Drop	Damper Torque Requirement	Exhaust Hood
Front Face Feature	Sizeable rectangular opening	12000 cfm	1296 ft/min	67.500 in x 19.750 in	0.262 in H2O	N/A	N/A

Pressure Drop in (in w.g.)

Supply fan	
Air section	0.48
Filter section	0.59
Coil section	0.09
Coil section	0.64
Coil section	0.11
Humidification section	0.02
Fan section	0.26
Internal Static Pressure	**2.19**
External Static Pressure	**3.00**
Total Static Pressure	**5.19**





1 Opening front
19.75 x 67.5
2 Plenum fan - 15in. dd
plenum, full width, M press
Supply fan 5 hp 200-208/3
Backdraft damper (4)
3 Pipe cabinet left (6)
4 Heating coil - 1 Coil type
NS (4)
5 Cooling coil - 6 Coil type
UF
6 Standard Traq damper
back
38.66 x 65.3
7 Hood back
8 Angled filters -

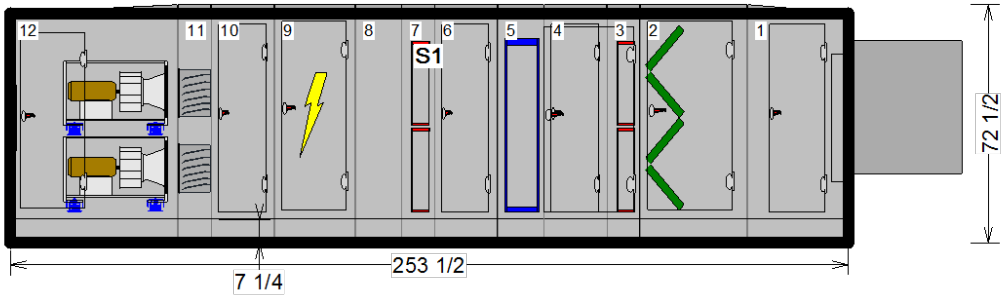
Doors
20 width x 54 height
15 width x 58 height
28 width x 57 height
18 width x 58 height
27 width x 58 height

For maneuvering purposes, include 1.125 inches to each ship split length for overlapping panel flange. Flange will not add to overall installed unit length shown.

OPENING AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS / RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES / NOT TO SCALE

Unit size: 57.5" int ht 84" int wid	Job Name: Remsen Hall	Wall thickness: 3" - R19 Casing
Product group: Outdoor unit	Actual airflow: 12000	Proposal Number:
Integral base frame: 7.25 in. integral base frame	Sales Office:	Tags: ST-DX-ST-H
Paint: Slate gray		Rigging weight: 7587.8 / Installed weight: 7984.3

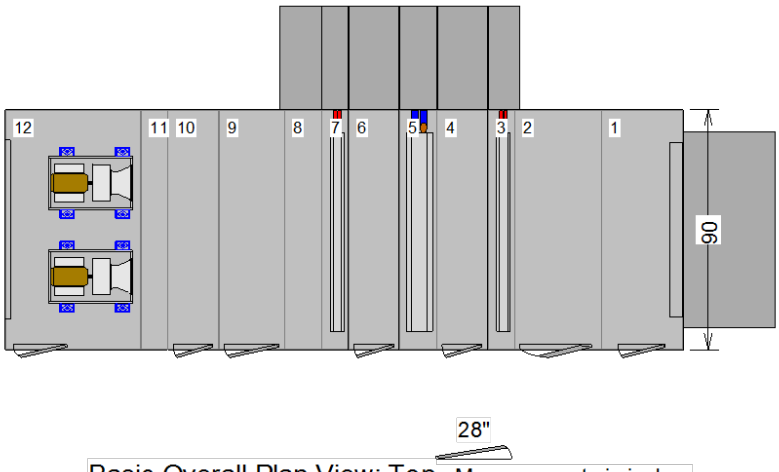
Performance Climate Changer
Air Handlers



For maneuvering purposes, include 1.125 inches to each ship split length for overlapping panel flange. Flange will not add to overall installed unit length sh

Installed Unit Weight 7984

Pos #	Module	Length	Weight
1	Air section	30 1/2	752.55
2	Filter section	32 1/2	530.46
3	Coil section	10	378.50
4	Air section	19 1/8	405.68
5	Coil section	14 1/8	839.85
6	Air section	19	332.39
7	Coil section	10	384.42
8	Humidification section	14	1578.87
9	Air section	24 5/8	532.29
10	Air section	19 1/8	338.06
11	Air section	10	141.48
12	Fan section	50 7/8	1373.29
	Roof Curb		396.48

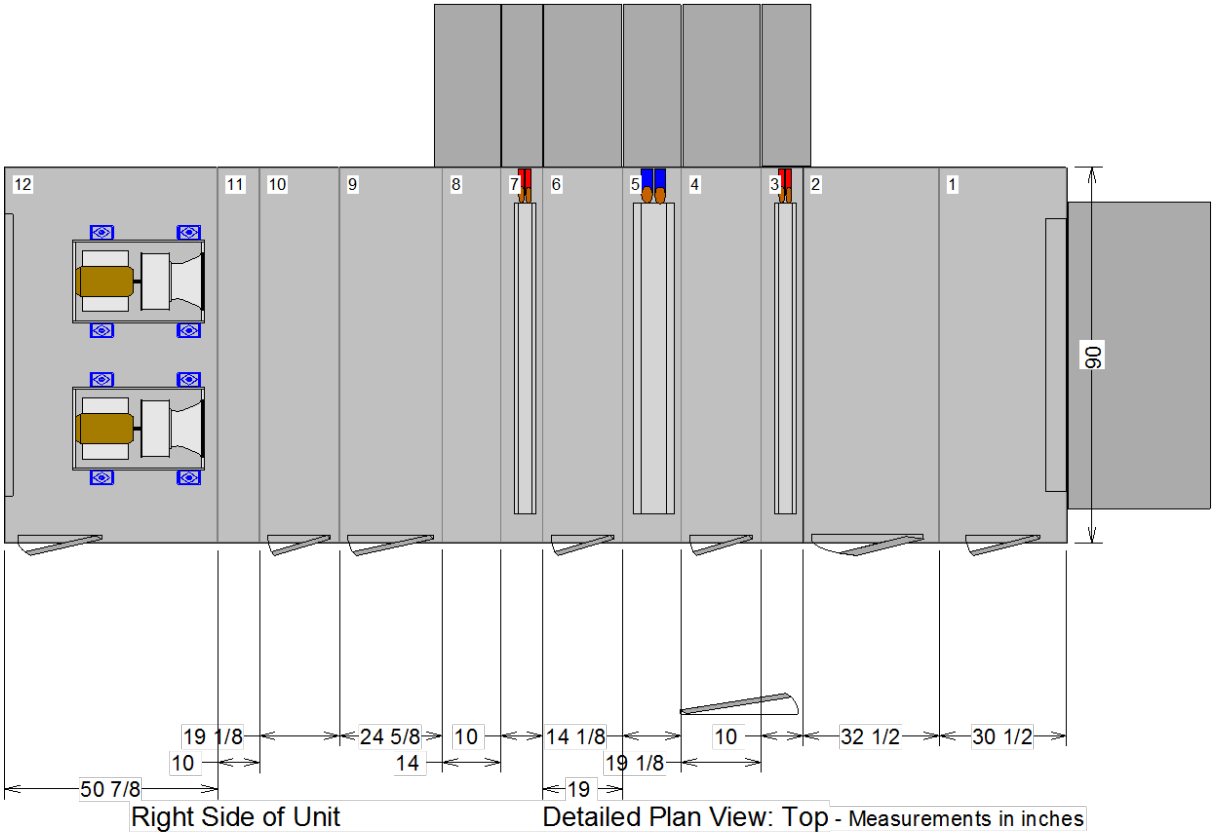


Basic Overall Plan View: Top - Measurements in inches

OPENING AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS / RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES / NOT TO SCALE

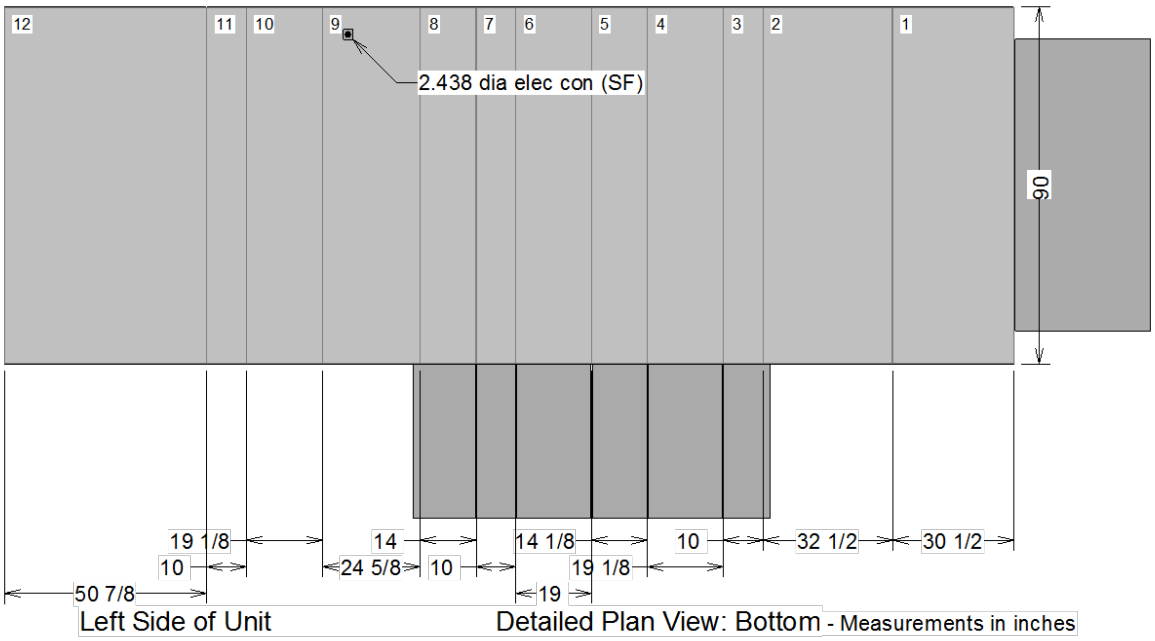
Unit size: 57.5" int ht 84" int wid	Job Name: Remsen Hall	Wall thickness: 3" - R19 Casing
Product group: Outdoor unit	Actual airflow: 12000	Proposal Number:
Integral base frame: 7.25 in. integral base frame	Sales Office:	Tags: ST-DX-ST-H
Paint: Slate gray		Rigging weight: 7587.8 / Installed weight: 7984.3

TRANE
Performance Climate Changer
Air Handlers



Right Side of Unit

Detailed Plan View: Top - Measurements in inches



Left Side of Unit

Detailed Plan View: Bottom - Measurements in inches

OPENING AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS / RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES / NOT TO SCALE

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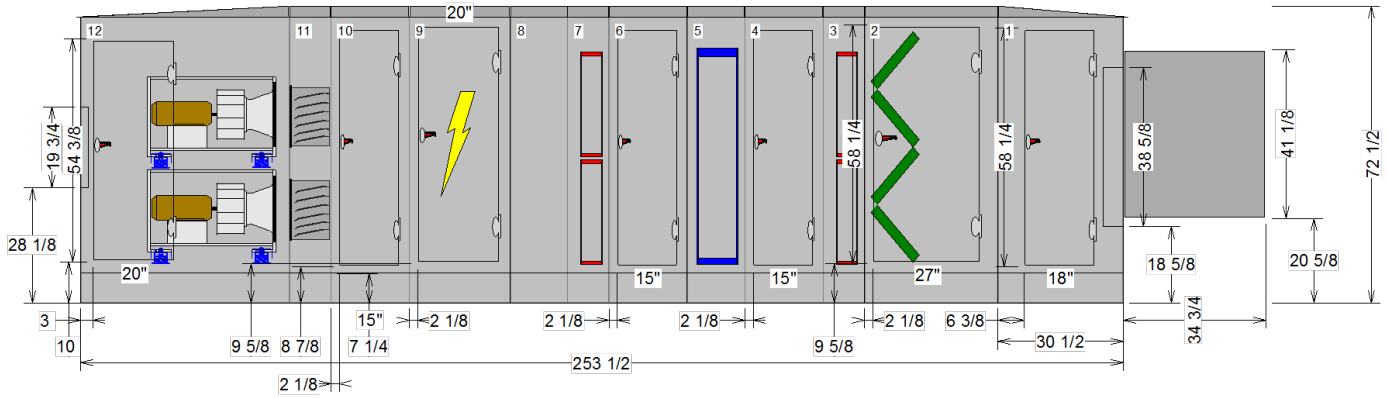
TRANE
Performance Climate Changer
Air Handlers



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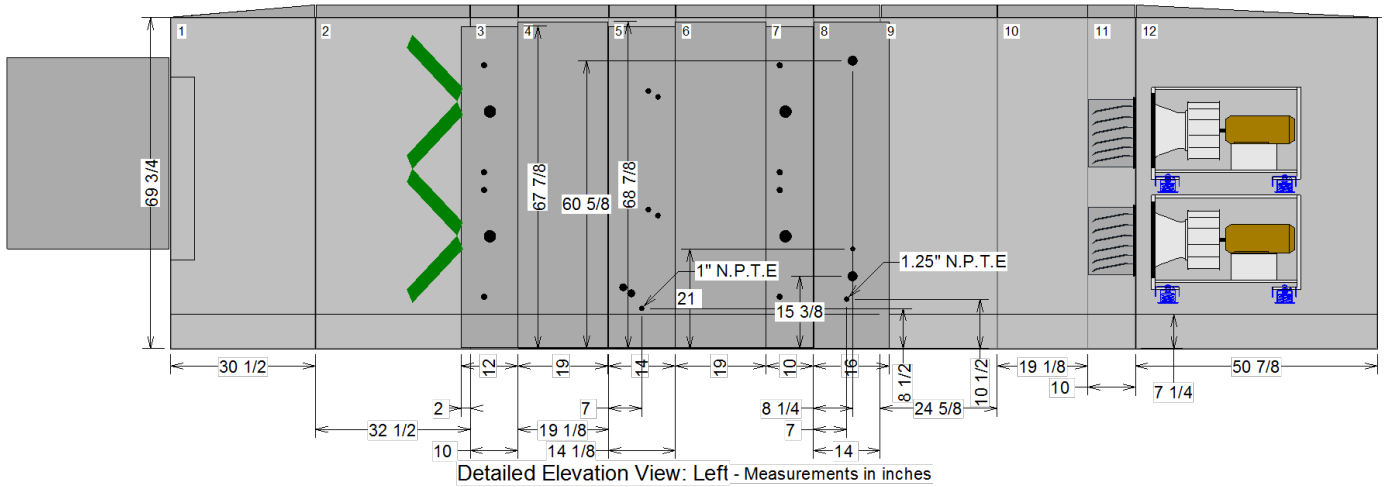
TRANE
Performance Climate Changer
Air Handlers



Detailed Elevation View: Left - Measurements in inches

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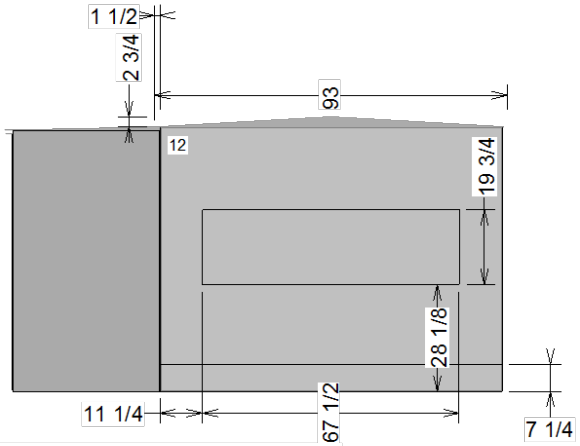
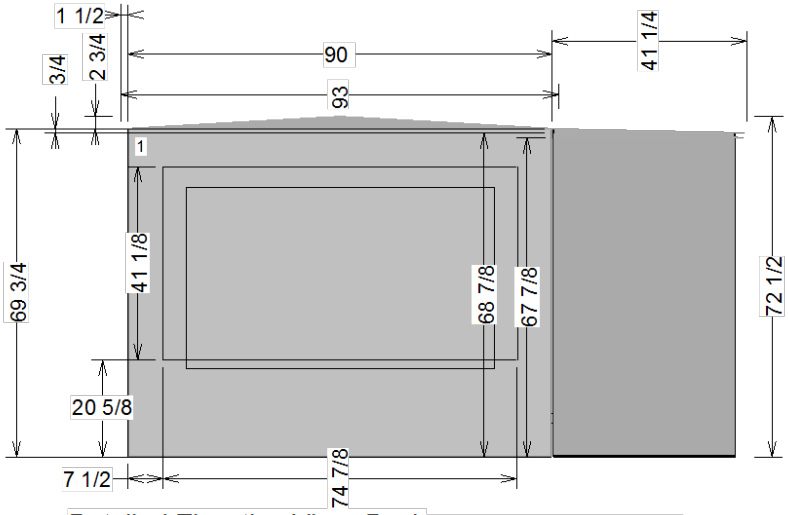
TRANE
Performance Climate Changer
Air Handlers



Detailed Elevation View: Front - Measurements in inches



Detailed Elevation View: Back - Measurements in inches

OPENING AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS / RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES / NOT TO SCALE

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Product group: Outdoor unit	Actual airflow: 12000	Proposal Number:
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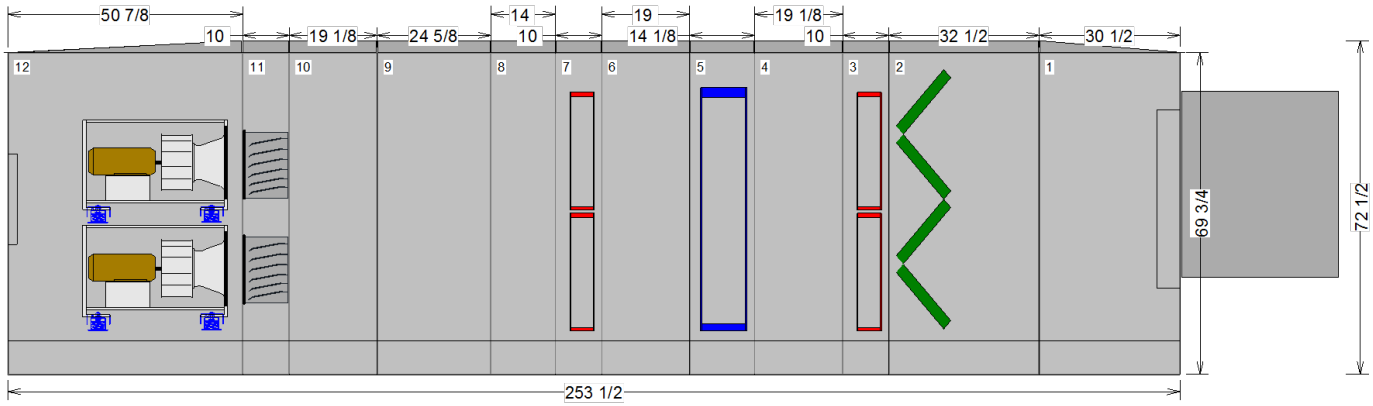
TRANE
Performance Climate Changer
Air Handlers



NPTI : National Pipe Thread Internal Connection
NPTE : National Pipe Thread External Connection

OPENING AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS / RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES / NOT TO SCALE

Unit size: 57.5" int ht 84" int wid	Job Name: Remsen Hall	Wall thickness: 3" - R19 Casing
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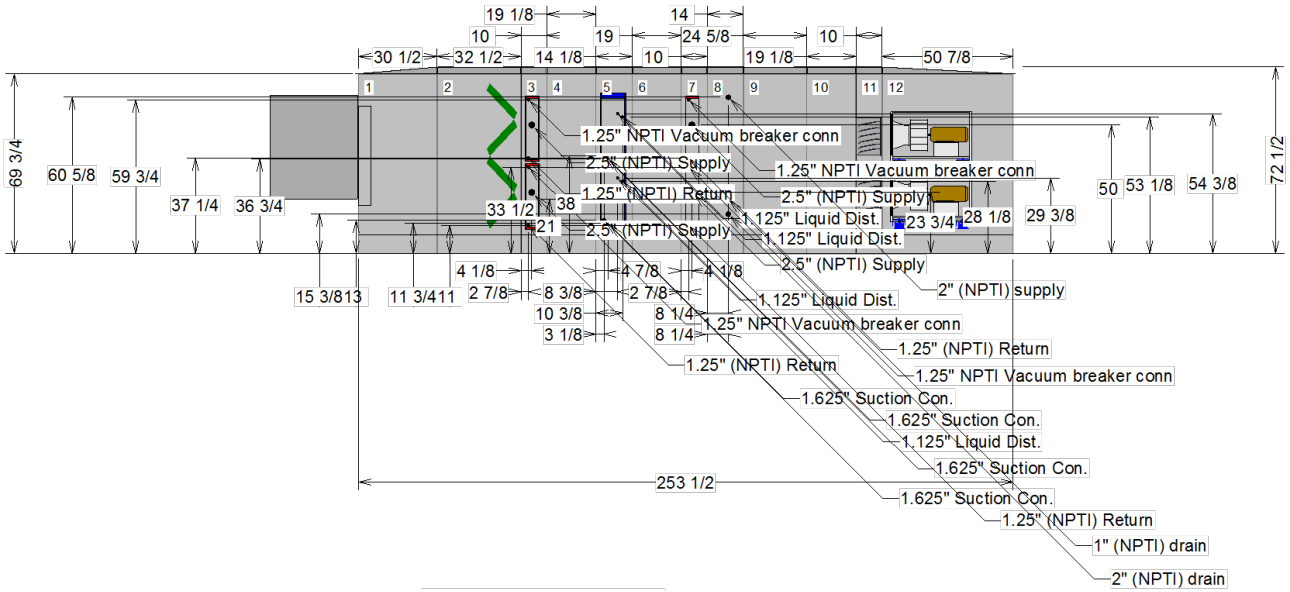
TRANE
Performance Climate Changer
Air Handlers



Coil connection view: Left - Measurements in inches

NPTI : National Pipe Thread Internal Connection
NPTE : National Pipe Thread External Connection

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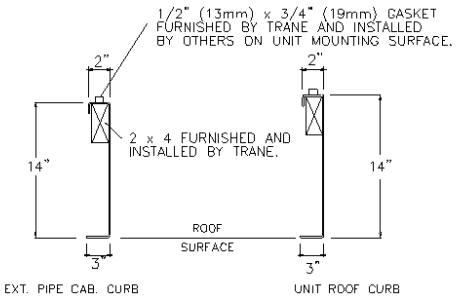
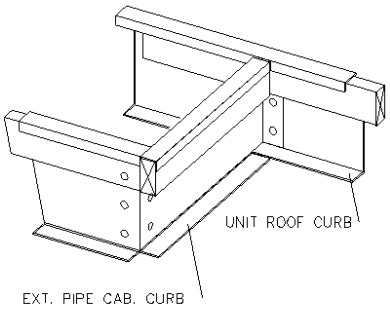
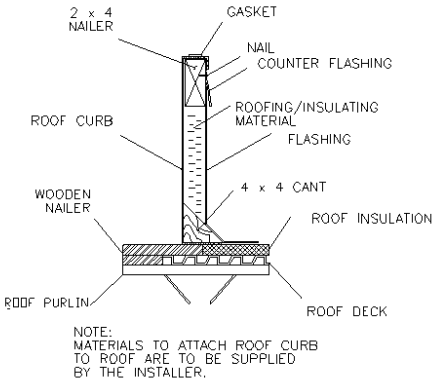
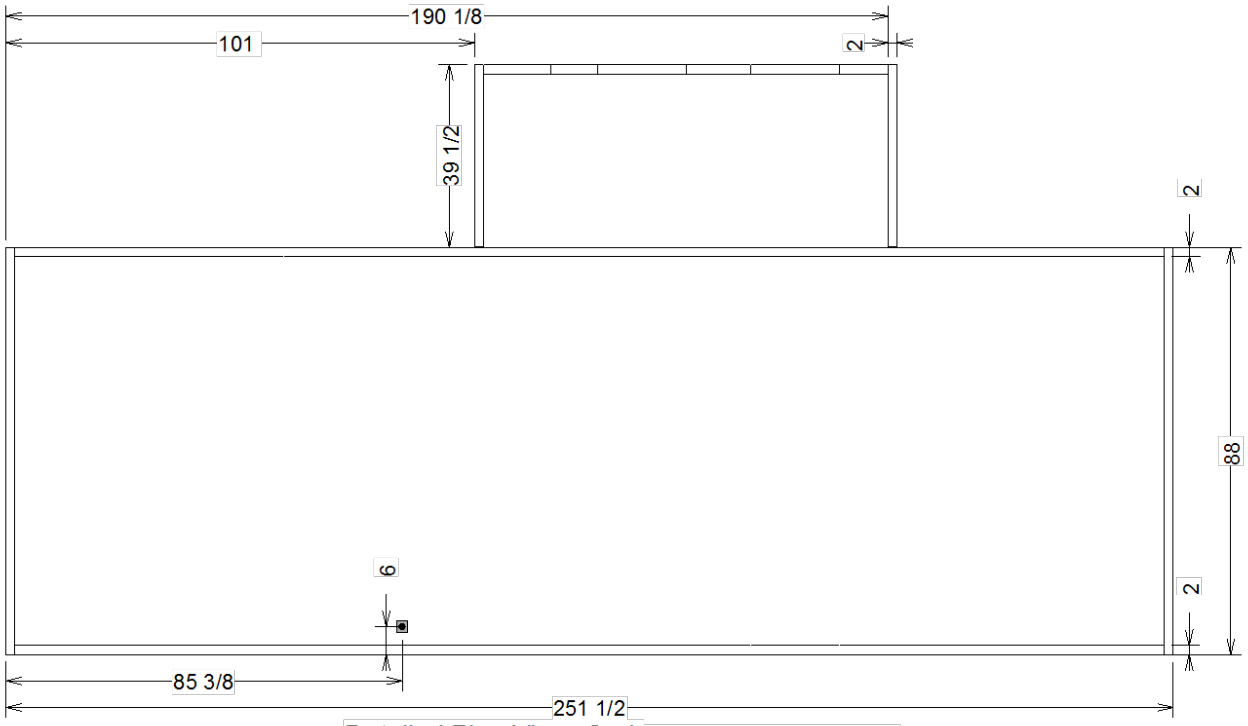
Paint: Slate gray		Rigging weight: 7587.8 / Installed weight: 7984.3

TRANE
Performance Climate Changer
Air Handlers









Detailed Plan View: Curb - Measurements in inches

OPENING AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS / RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES / NOT TO SCALE

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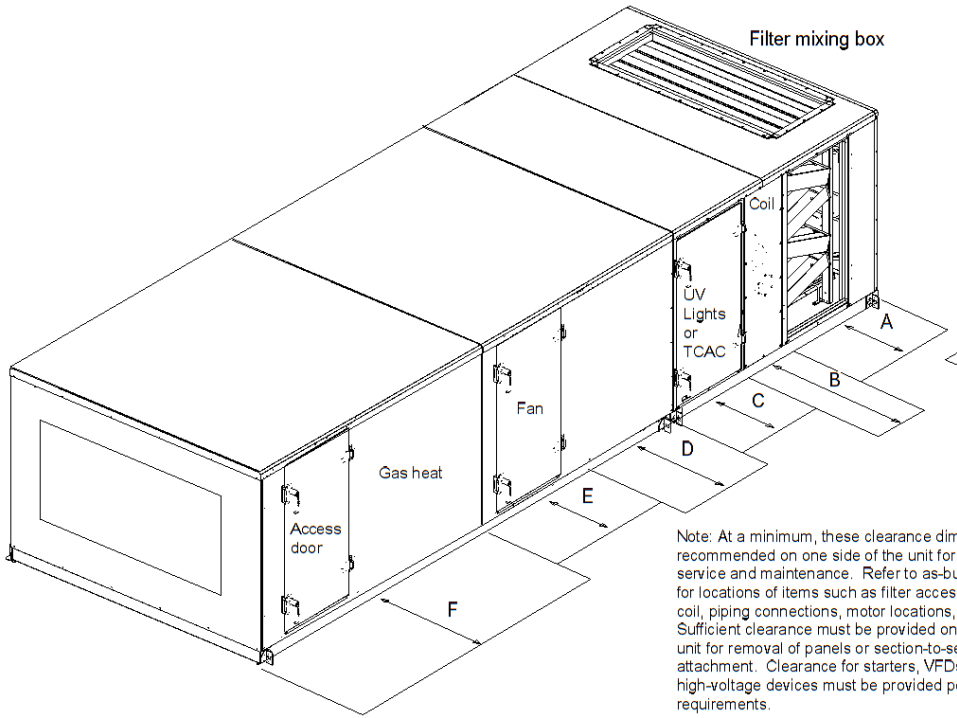
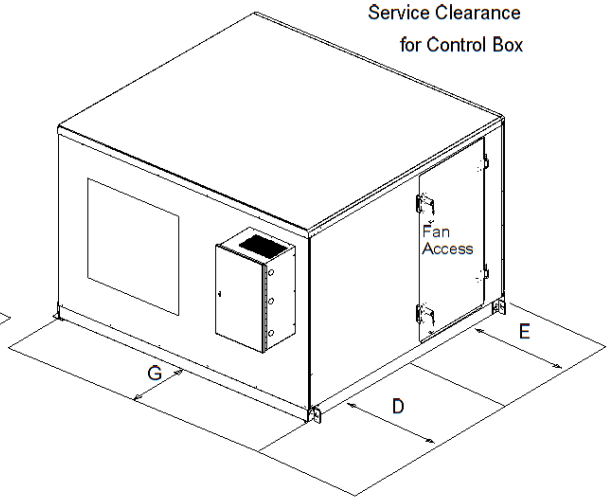
Product group: Outdoor unit	Actual airflow: 12000	Proposal Number:
Integral base frame: 7.25 in. integral base frame	Sales Office:	Tags: ST-DX-ST-H
Paint: Slate gray		Rigging weight: 7587.8 / Installed weight: 7984.3

TRANE
Performance Climate Changer Air Handlers

SERVICE CLEARANCES
EXAMPLE UNIT - NOT CONFIGURED AS SELECTED.



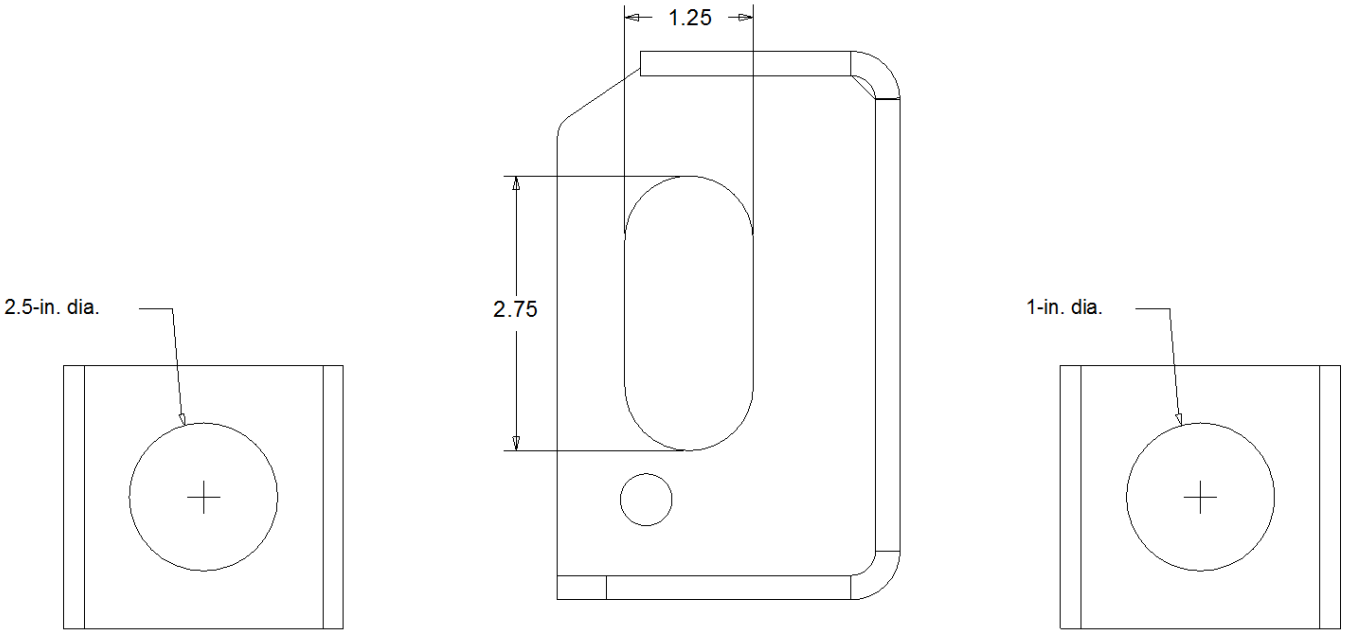


Note: At a minimum, these clearance dimensions are recommended on one side of the unit for regular service and maintenance. Refer to as-built submittal for locations of items such as filter access doors, coil, piping connections, motor locations, etc. Sufficient clearance must be provided on all sides of unit for removal of panels or section-to-section attachment. Clearance for starters, VFDs, or other high-voltage devices must be provided per NEC requirements.

Component	All Sizes
G (control box HV or box size large)	36
G (Box size small or medium)	13

	UNIT WIDTH																				
Component	54	60	68.5	74	78	82	90	95.5	102	108	114.5	120	127.5	132	138	142.5	150	156.5	162	168	174
A (filter)	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
B (coil)	64	70	79	84	88	92	100	106	112	118	125	130	138	142	148	153	160	167	172	178	184
B (electric heat coil)	54	60	69	74	78	82	90	96	102	108	115	120	128	132	138	143	150	157	162	168	174
C (UV or TCAC	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
D (External VFD	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64
D (Internal VFD	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
E (fan)	54	54	54	60	60	60	66	66	66	66	70	70	77	77	77	77	93	93	101	101	101
F-NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Base Detail

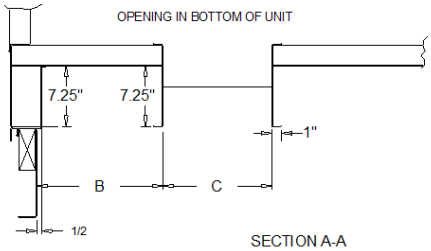


Pipe Cabinet Lug

Lifting Lug

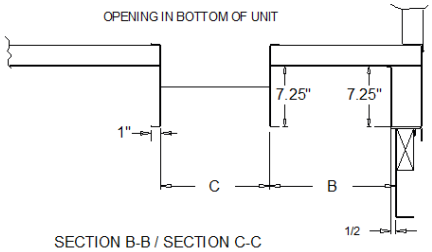
Hood Lug

RELATIONSHIP OF CURB TO UNIT AS-BUILT



SECTION A-A

SUPPLY FAN OR DISCHARGE PLENUM (SEE NOTE 1)

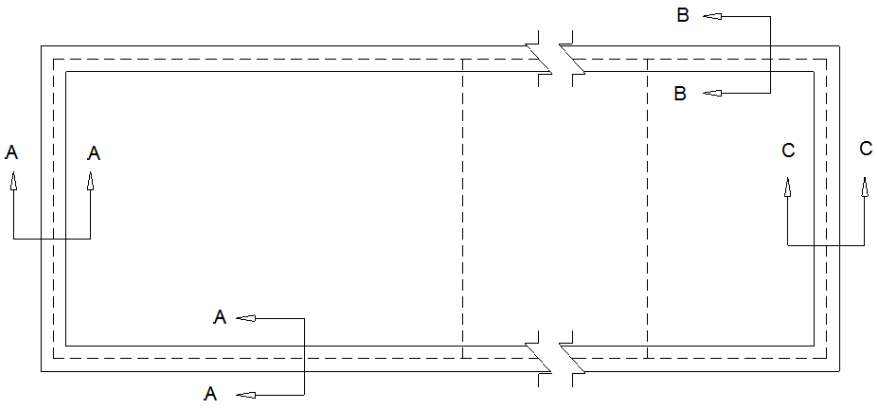


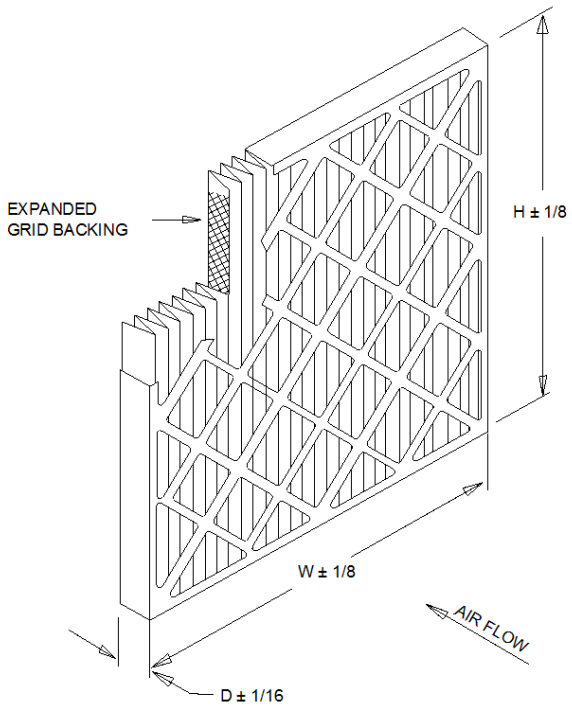
SECTION B-B / SECTION C-C

MIX BOX, RETURN FAN OR EXHAUST FAN SECTION (SEE NOTE 1)

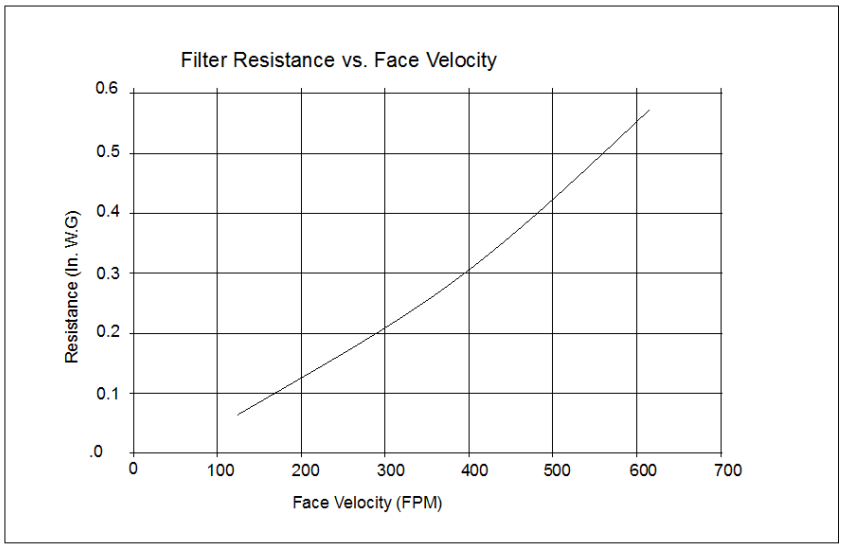
NOTE:

1. B and C are representative of dimensions on the accessory as-built used to locate opening(s) in the roof surface.



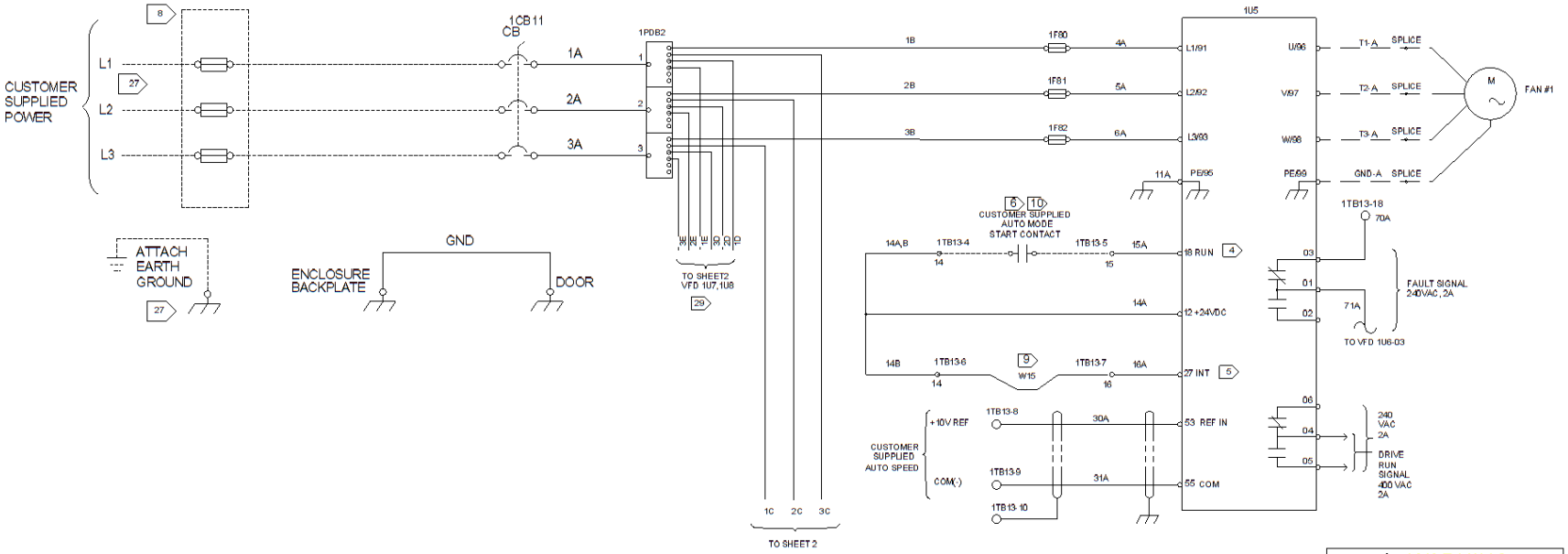


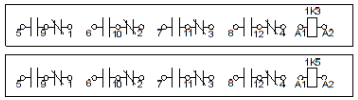
NOMINAL SIZE (WxHxD)	ACTUAL SIZE (WxHxD)	RATED AIR FLOW (CFM)	INITIAL RESISTANCE (IN. W.G.)	MEDIA AREA (SQUARE FEET)	FILTER UNIT WEIGHT (LBS)
12x24x2	11-3/8 x 23-3/8 x 1-3/4	1000	0.41	10.5	0.9
16x20x2	15-1/2 x 19-1/2 x 1-3/4	1120	0.41	10.9	1.1
20x20x2	19-1/2 x 19-1/2 x 1-3/4	1400	0.41	14.5	1.3
24x24x2	23-3/8 x 23-3/8 x 1-3/4	2000	0.41	21.1	1.6



STANDARD CONSTRUCTION
1. 100 % Synthetic White Media
2. 17.5 Pleats Per Foot
3. Expanded Metal Pleat Supports
4. Moisture Resistant Beverage Board Frame
5. Double Wall Frame

NOTES
1. MERV 13 per ASHRAE 52.2-2012
Tested at 492 FPM on 24x24x2 Nominal Size
2. Final Resistance: 1.0" W.G.
3. Rated Velocity: 500 FPM
4. Classified per U.L. Standard 900 for Flammibility
5. Maximum Operating Temperature: 200 deg. F





LEGEND	
DEVICE DESIGNATION	DESCRIPTION
1CB11	CIRCUIT BREAKER
1F80 TO 1F85	VFD FUSES
1PDB2	POWER DISTRIBUTION BLOCK
1TB13	TERMINAL STRIP CONTROL CIRCUIT
1U5	VFD CONTROLLER 1
1U6	VFD CONTROLLER 2
1U7	VFD CONTROLLER 3
1U8	VFD CONTROLLER 4
1K3	START / STOP RELAY SUP
1K5	LOW LIMIT RELAY SUP

VFD FUSES				
FUSE	VOLTAGE	VFD TR150	P/N	CLASS
1F80 1F81 1F82 1F83 1F84 1F85	200	H4	JLLN050	T
		H5	JLLN080	T
		H6	JLLN100	T
	200-230	H3	CCMR025	CC
	230	H3	CCMR025	CC
		H4	JLLN050	T
		H5	JLLN080	T
		H6	JLLN100	T
	460	H2	CCMR015	CC
		H3	CCMR025	CC
		H4	JLLS050	T
		H5	JLLS080	T
		H6	JLLS125	T
	575	H6	JLLS060	T
		H5	CCMR020	CC
		H10	CCMR030	CC

NOTES:

1. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. PHANTOM LINES INDICATE CONTROL OPTION. REF. CONTROL PANEL SCHEMATIC FOR SPECIFIC DETAIL.
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTICAL CODE, STATE, AND LOCAL REQUIREMENTS. OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL APPLY. FIELD CONDUCTORS SHALL HAVE INSULATION RATING NOT LESS THAN 600V COPPER CONDUCTORS ONLY.
3. MINIMUM CIRCUIT AMPACITY, MAXIMUM FUSE SIZE, AND DISCONNECT SIZE ARE CALCULATED BASED ON THE INVERTER INPUT LINE CURRENTS PER ARTICLE 430-2 OF THE NATIONAL ELECTRICAL CODE.
4. PROGRAM TERMINAL 16 AS RUN.
5. PROGRAM TERMINAL 27 INV. COASTING STOP.
6. CLOSES TO RUN AUTO MODE OR BYPASS AUTO FOR OPTION VFD OR STARTER.
7. RELAY(S)--CONTACTS: SILVER-CADMIUM OXIDE. 1/6 HP 5AMP @ 120V AC, 1/3 HP 5AMP @240V AC. SEE 24V SCHEMATIC FOR COIL CONNECTIONS AND ACTUAL QUANTITY OF RELAYS
8. CUSTOMER SUPPLIED DEVICE, SUCH AS FUSE,BREAKER.
12. IF UNIT HAS SHIPPING SPLITS WIRING WILL TERMINATE TO MODULE AT EACH SHIPPING SPLIT
27. ATTACH GROUND OR EQUIPMENT GROUND.
28. AIRFLOW SWITCH INPUT, REFER TO LOW VOLTAGE SCHEMATIC.
29. APPLIES TO UNIT WITH FOUR FAN ARRAY.

CAUTION

USE COPPER CONDUCTORS ONLY!

UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.

FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

ATTENTION

N'UTILISER QUE DES CONDUCTEURS EN CUIVRE!

LES BORNES DE L'UNIT? NE SONT PAS CONÇUES POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS.

L'UTILISATION DE TOUT AUTRE CONDUCTEUR PEUT ENDOMMAGER L'?QUIPEMENT.

PRECAUCI?N

?UTILICE ?NICAMENTE CONDUCTORES DE COBRE!

LAS TERMINALES DE LA UNIDAD NO EST?N DISE?ADAS PARA ACEPTAR OTROS TIPOS DE CONDUCTORES.

SI NO LO HACE, PUEDE OCASIONAR DA?O AL EQUIPO.

DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	HIGH VOLTAGE PANEL
2	LOW VOLTAGE PANEL (UNIT SCHEMATIC)
3	AIR HANDLER SECTION

⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED. STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE.

FAILURE TO DO THE ABOVE BEFORE SERVICING COULD RESULT IN DEATH OR SERIOUS INJURY.

⚠ AVERTISSEMENT

TENSION DANGEREUSE!

COUPER TOUTES LES TENSIONS ET OUVRIR LES SECTIONNEURS ?DISTANCE, PUIS SUIVRE LES PROCÉDURES DE VERROUILLAGE ET DES ?TIQUETTES AVANT TOUTE INTERVENTION. V?RIFIER QUE TOUS LES CONDENSATEURS DES MOTEURS SONT D?CHARGÉS. DANS LE CAS D'UNIT?S COMPORTANT DES ENTRAÎNEMENTS ? VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRAÎNEMENT POUR D?CHARGER LES CONDENSATEURS.

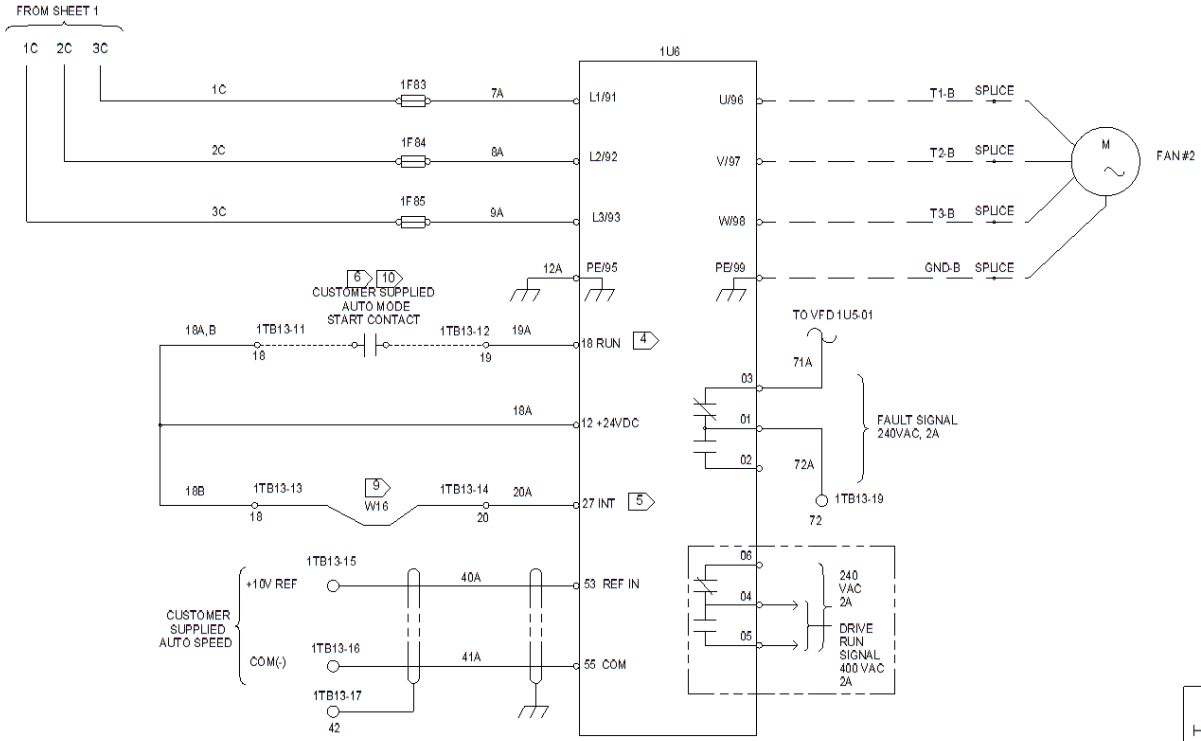
NE PAS RESPECTER CES MESURES DE PR?CAUTION PEUT ENTRAÎNER DES BLESSURES GRAVES POUVANT ?TRE MORTELLES.

⚠ ADVERTENCIA

¡VOLTAJE PELIGROSO!

DESCONECTE TODA LA ENERG?A EL?CTRICA, INCLUSO LAS DESCONEXIONES REMOTAS Y SIGA LOS PROCEDIMIENTOS DE CIERRE Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGÚRESE DE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN DESCARGADO EL VOLTAJE ALMACENADO. PARA LAS UNIDADES CON EJE DE DIRECCI?N DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR.

EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODRÍA OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.



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1U7	VFD CONTROLLER 3
1U8	VFD CONTROLLER 4
1K3	START / STOP RELAY SUP
1K5	LOW LIMIT RELAY SUP

VFD FUSES				
FUSE	VOLTAGE	VFD TR150	P/N	CLASS
1F80 1F81 1F82 1F83 1F84 1F85	200	H4	JLLN050	T
		H5	JLLN080	T
		H6	JLLN100	T
	200-230	H3	CCMR025	CC
	230	H3	CCMR025	CC
		H4	JLLN050	T
		H5	JLLN080	T
		H6	JLLN100	T
	460	H2	CCMR015	CC
		H3	CCMR025	CC
		H4	JLLS050	T
		H5	JLLS080	T
		H6	JLLS125	T
	575	H6	JLLS080	T
		H9	CCMR020	CC
		H10	CCMR030	CC

NOTES:

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6. CLOSES TO RUN AUTO MODE OR BYPASS AUTO FOR OPTION VFD OR STARTER.
7. RELAY(S)--CONTACTS: SILVER-CADMIUM OXIDE: 1/6 HP 5AMP @ 120V AC, 1/3 HP 5AMP @240V AC. SEE 24V SCHEMATIC DIAGRAM FOR COIL CONNECTIONS AND ACTUAL QUANTITY OF TRANSFORMER RELAYS.
8. CUSTOMER SUPPLIED DEVICE, SUCH AS FUSE,BREAKER.
9. OPTIONAL TRANE POWER DISTRIBUTION BLOCK
12. IF UNIT HAS SHIPPING SPLITS, WIRING WILL TERMINATE TO MODULE AT EACH SHIPPING SPLIT
27. ATTACH GROUND OR EQUIPMENT GROUND.
28. AIRFLOW SWITCH INPUT, REFER TO LOW VOLTAGE SCHEMATIC.
29. APPLIES TO UNIT WITH FOUR FAN ARRAY.

CAUTION

USE COPPER CONDUCTORS ONLY!

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FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

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DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	HIGH VOLTAGE PANEL
2	LOW VOLTAGE PANEL (UNIT SCHEMATIC)
3	AIR HANDLER SECTION

⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE.

FAILURE TO DO THE ABOVE BEFORE SERVICING COULD RESULT IN DEATH OR SERIOUS INJURY.

⚠ AVERTISSEMENT

TENSION DANGEREUSE!

COUPER TOUTES LES TENSIONS ET OUVRIR LES SECTIONNEURS ? DISTANCE, PUIS SUIVRE LES PROC?DURES DE VERROUILLAGE ET DES ?TIQUETTES AVANT TOUTE INTERVENTION. V?RIFIER QUE TOUS LES CONDENSATEURS DES MOTEURS SONT D?CHARG?S. DANS LE CAS D'UNIT?S COMPORTANT DES ENTRA?NEMENTS ? VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRA?NEMENT POUR D?CHARGER LES CONDENSATEURS.

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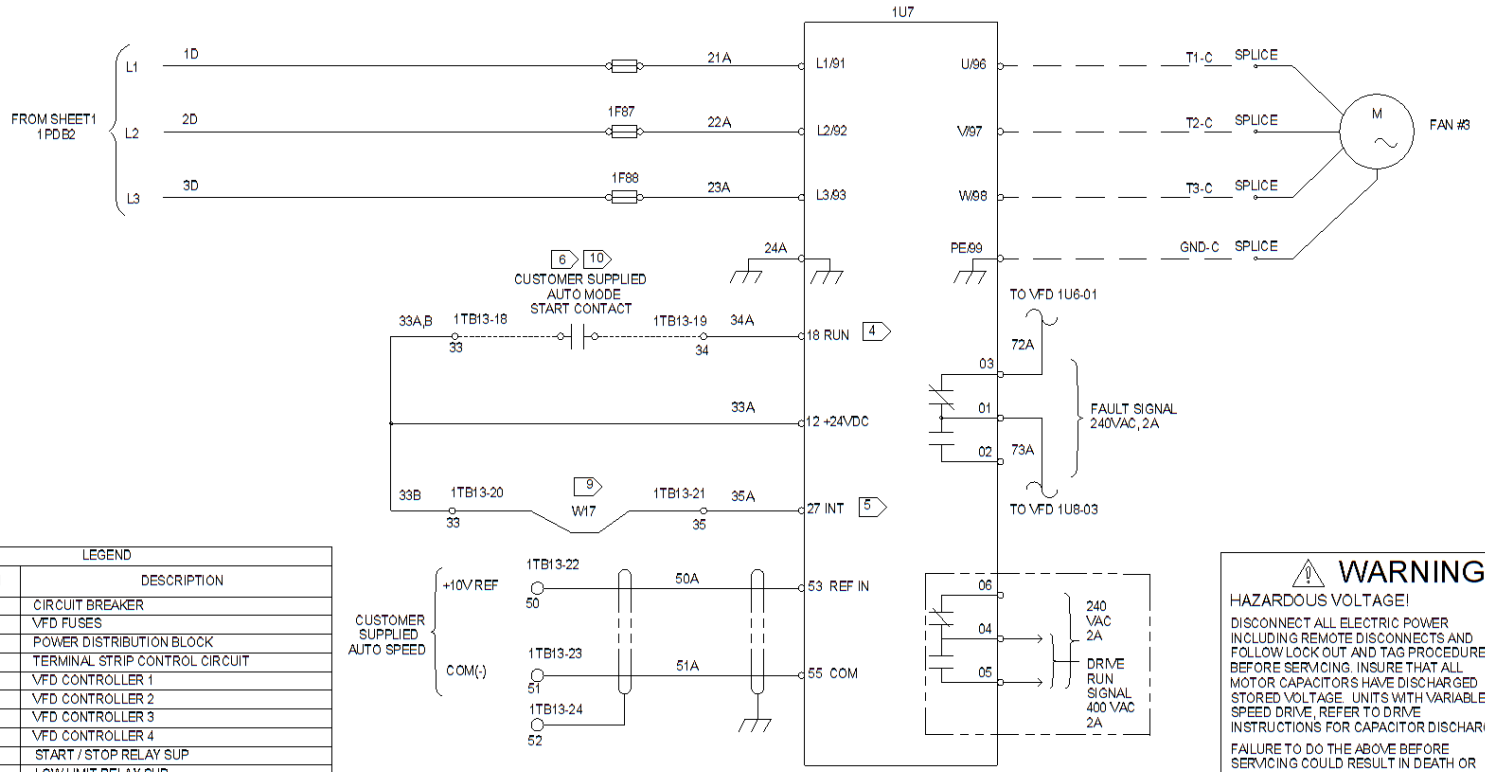
EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODR?A OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.



LEGEND	
DEVICE DESIGNATION	DESCRIPTION
1CB11	CIRCUIT BREAKER
1F80 TO 1F91	VFD FUSES
1PDB2	POWER DISTRIBUTION BLOCK
1TB13	TERMINAL STRIP CONTROL CIRCUIT
1U5	VFD CONTROLLER 1
1U6	VFD CONTROLLER 2
1U7	VFD CONTROLLER 3
1U8	VFD CONTROLLER 4
1K3	START / STOP RELAY SUP
1K5	LOW LIMIT RELAY SUP

VFD FUSES				
FUSE	VOLTAGE	VFD TR150	P/N	CLASS
1F80	200	H1	CCMR010	CC
1F81		H2	CCMR015	CC
1F82		H3	CCMR025	CC
1F83		H4	JLLN050	T
1F84	230	H1	CCMR010	CC
1F85		H2	CCMR015	CC
1F86		H3	CCMR025	CC
1F87		H4	JLLN050	T
1F88	460	H1	CCMR010	CC
1F89		H2	CCMR015	CC
1F90		H3	CCMR025	CC
1F91		H4	JLLS050	T
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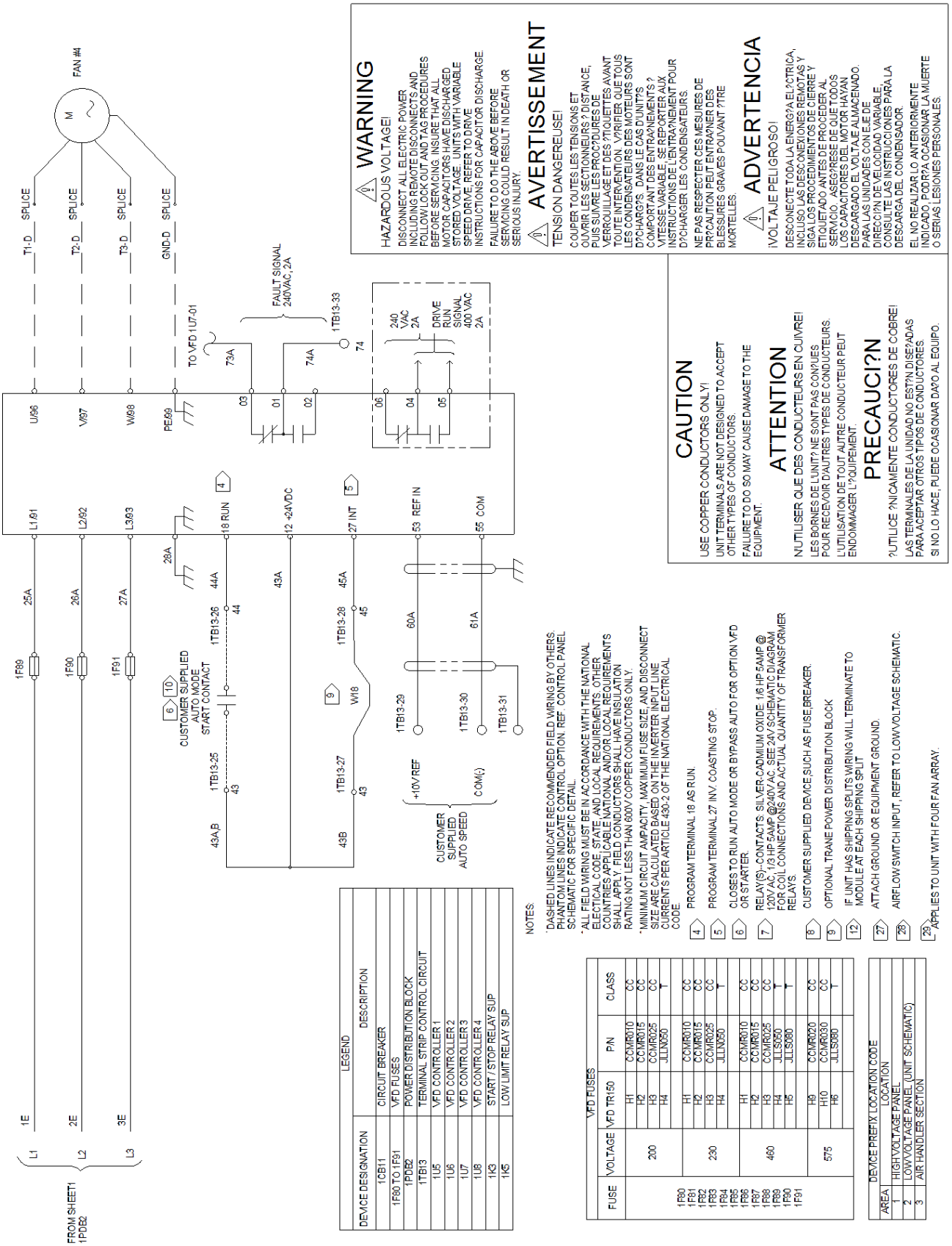

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VFD FUSES				
FUSE	VOLTAGE	VFD TR150	P/N	CLASS
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		H2	CCMR015	CC
		H3	CCMR025	CC
		H4	JLLN050	T
	230	H1	CCMR010	CC
		H2	CCMR015	CC
		H3	CCMR025	CC
		H4	JLLN050	T
	460	H1	CCMR010	CC
		H2	CCMR015	CC
		H3	CCMR025	CC
		H4	JLLS050	T
		H5	JLLS080	T
	575	H9	CCMR020	CC
		H10	CCMR030	CC
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AREA	LOCATION
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2	LOW VOLTAGE PANEL (UNIT SCHEMATIC)
3	AIR HANDLER SECTION

GENERAL

Outdoor air handling units will be shipped with all openings covered to protect unit interior from in-transit debris.

Installing contractor is responsible for long term storage in accordance with the Installation, Operation, and Maintenance manual (CLCH-SVX07B-EN).

Unit shall be UL and C-UL Listed.

Unit sound performance data shall be provided using AHRI Standard 260 test methods and reported as sound power. Trane, in providing this program and data, does not certify or warrant NC levels. These levels are affected by factors specific to each application and/or installation and therefore unable to be predicted or certified by Trane.

Manufacturer provided VFDs shall be certified to AHRI Standard 1210 "Performance Rating of Variable Frequency Drives" to ensure documented and reliable VFD efficiency.

Unit Construction

Outdoor unit roofs shall incorporate a standing seam on the exterior to ensure a rigid roof construction and prevent water infiltration. Roof assembly shall overhang all walls by 1.5-inch minimum to prevent sheeting from roof to side panels. Rain gutters shall also be provided over all doors shorter than total unit height to direct rain away from the door assembly. Outdoor roofs shall be sloped, not less than 0.125 inches per foot, for water drainage. Where outdoor units are shipped in multiple sections, provide standing-seam joiners at each split with adhesive, hardware, and cover strips for field joining by the installing contractor.

All unit panels shall be double-wall minimum R-19 construction to facilitate cleaning of unit interior. Unit panels shall be provided with a mid-span, no-through-metal, internal thermal break. Units provided with R-19 thermal performance shall include double thermal break design on casing roof and walls. Casing thermal performance shall be such that under 55°F supply air temperature and design conditions on the exterior of the unit of 81°F dry bulb and 73°F wet bulb, condensation shall not form on the casing exterior.

All outdoor AHU interior casing panels will be made of galvanized steel.

Unit paint

External surface of unit casing will be coated with water-based polyurethane paint. Color to be standard "Slate Gray". Factory-painted units will be able to withstand a salt spray test in accordance with ASTM B117 for a minimum of 500 consecutive hours and shall meet the following requirements following the salt-spray test:
- Mean scribe creepage rating of at least 6 per ASTM D1654 procedure A
- Blister size no larger than #6 per ASTM D714
- Blister density no greater than Medium per ASTM D714
- No onset of red rust

Casing Deflection

The casing shall not exceed 0.0042 inch deflection per inch of panel span at 1.00 times design static pressure. Total maximum design static shall not exceed +10 inches w.g. in all positive pressure sections and -10 inches w.g. in all negative pressure sections.

Floor Construction

The unit floor shall be of sufficient strength to support a 300.0 lb load during maintenance activities and shall deflect no more than 0.0042 inch per inch of panel span.

Unit base
Manufacturer to provide a full perimeter integral base frame for either ceiling suspension of units or to support and raise all sections of the unit for proper trapping. Indoor unit base frame will either be bolted construction or welded construction. All outdoor unit base frames shall be welded construction. For indoor units, refer to schedule for base height and construction type. Contractor will be responsible for providing a housekeeping pad when unit base frame is not of sufficient height to properly trap unit. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel. Unit base height to be included in total height required for proper trap height.

Insulation
Panel insulation shall provide a minimum thermal resistance (R) value of 19 ft^2-h-^oF/Btu throughout the entire unit. Insulation shall completely fill the panel cavities in all directions so that no voids exist and settling of insulation is prevented. Panel insulation shall comply with NFPA 90A.

Drain Pan
In sections provided with a drain pan, the drain pan shall be designed in accordance with ASHRAE 62.1. To address indoor air quality (IAQ) the drain pan shall be sloped in two planes promoting positive drainage to eliminate stagnant water conditions. Drain pan shall be insulated, and of double wall construction. The outlet shall be the lowest point on the pan, and shall be of sufficient diameter to preclude drain pan overflow under normally expected operating conditions. All drain pans connections shall have a threaded connection, extending a minimum of 2-1/2" beyond the unit base, and shall be made from the same material as the drain pan. Drain pan located under a cooling coil shall be of sufficient size to collect all condensate produced from the coil.
Refer to Product Data for specific information on which sections are supplied with a drain pan, the drain pan material and connection location.

Access Door Construction
Access doors shall be the same R value as the main unit casing. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels respectively. All doors shall be provided with a thermal break construction of door panel and door frame. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage. Surface mounted handles shall be provided to allow quick access to the interior of the functional section and to prevent through cabinet penetrations that could likely weaken the casing leakage and thermal performance. Handle hardware shall be designed to prevent unintended closure. Access doors shall be hinged and removable for quick easy access. Door handle hardware shall be adjustable and visually indicate locking position of door latch external to the section. Door hinges shall be stainless steel.

All doors shall be a minimum of 60" high when sufficient height is available or the maximum height allowed by the unit height.

A single door handle linked to multiple latching points shall be provided for each door. An optional shatterproof window shall be provided in access doors where indicated on the plans. Window shall either be single pane, or thermal dual pane, as defined on schedule. Window shall be capable of withstanding unit operating pressures and shall be safe for viewing UV-C lamps.
Refer to Product Data for specific information on which sections are supplied with an access door, the door location, a single handle and a window.

Factory-supplied Curb
Outdoor AHU will be provided with a factory-supplied roof curb. Curb will be shipped to jobsite disassembled. Contractor will be responsible for assembly and mounting to roof structure per the Roof Curb Manual. Units with factory-supplied external piping cabinet(s), the factory-supplied curb will include a curb section for the pipe cabinet(s).
Refer to the Roof Curb Detail drawing and Product Data section of submittal for height of factory-supplied roof curb(s).

MIXING SECTION
A mixing section shall be provided to support the damper assembly for outdoor, return, and/or exhaust air.

Inlet Hoods
Inlet hoods are provided on the outside air openings and equipped with high performance moisture eliminators to minimize water carryover from the outside into the unit casing. Eliminators also perform the function of a bird screen to prevent nesting.
Refer to the unit As-Built and Product Data section for specific information on which sections are supplied with inlet hood.

External Pipe Cabinets
Piping cabinet is supplied factory-assembled and will be double wall, foam injected construction. Piping cabinets are shipped separate to be field installed on the side of the unit.
Refer to the unit As-Built and Product Data section for specific information on which sections are supplied with a corresponding pipe cabinet and pipe cabinet access doors.

Airflow Measurement Station (Std. TRAQ Dampers)
A factory-mounted airflow measurement station tested in accordance with AMCA Standard 611 and bearing the AMCA Ratings Seal for Airflow Measurement Performance shall be provided in the outdoor and/or return air opening to measure airflow. The damper blades shall be galvanized steel, housed in a galvanized steel frame and mechanically fastened to a rotating axle rod. The dampers shall be rated for a maximum leakage rate of 4 cfm/ft² at 1 in. w.g. complying with ASHRAE 90.1 maximum damper leakage. The standard airflow measurement station shall be capable of measuring from 15 percent to 100 percent of unit nominal airflow. The airflow measurement station shall adjust for temperature variations and provide a 2 to 10 Vdc signal that corresponds to actual airflow for controlling and documenting airflow. The accuracy of the airflow measurement station shall be ±5 percent.

The following specifications apply only to units with outside air and return air dampers, with actuators. The 5 year warranty applies only to these items.
This unit contains Economizer that meets or exceeds all mandatory requirements prescribed by Title 24, including but not limited to:
- 5 yr parts only warranty
- Successfully tested to 60,000 Actuations
- Less than 10 cfm/sq.ft. of damper leakage at 1" WG per AMCA 500L

FILTER SECTION
A section shall be provided to support the filter rack as indicated throughout the unit. *Refer to Product Data and As-Built sections of the submittal for specific locations within each unit.*

Primary Filters
2 inch pleated media filters made with 100% synthetic fibers that are continuously laminated to a supported steel wire grid with water repellent adhesive shall be provided. Filters shall be capable of operating up to 625 fpm face velocity without loss of filter efficiency and holding capacity. The filters shall have a MERV 13 rating when tested in accordance with the ANSI/ASHRAE Standard 52.2.

COIL SECTION WITH FACTORY INSTALLED COIL

The coil section shall be provided complete with coil and coil holding frame. The coils shall be installed such that headers and return bends are enclosed by unit casings. If two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil and be of the same material as the primary drain pan. Like the primary drain pan, the intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

Casing penetrations supplied for hydronic drain and vents. Piping contractor shall provide extended piping.

No casing penetrations supplied for hydronic drain and vents. If required, piping contractor will need to drill drain and vent penetrations using factory located features provided in coil panel.

Refrigerant Cooling Coils: R-410A

The coils shall have aluminum fins and seamless copper tubes. The fins shall have collars drawn, belled, and firmly bonded to tubes by mechanical expansion of the tubes. Suction and liquid line connections shall extend to the unit exterior. The coil casing may be galvanized or stainless steel. Refer to the Product Data section of the submittal for the coil casing material.
The coils shall be proof-tested to 715 psig and leak-tested to 300 psig air pressure under water. After testing, the inside of the coils shall be dried, all connections shall be sealed, and the coil shall be shipped with a charge of dry air.
Suction headers and liquid connections shall be constructed of copper tubing with connections penetrating unit casings to permit sweat connections to refrigerant lines. The coils shall have equalizing vertical distributors sized according to the capacities of the coils. Coils are certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table 1 of the Standard. Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Refrigerant coil tubes are 1/2" [13mm] OD, 0.016" [0.406mm] thick, internally enhanced copper.

NS Steam Heating Coil

The coils shall have aluminum fins and seamless copper tubes. Copper fins may be applied to coils with 1-inch tubes. The fins shall have collars drawn, belled, and firmly bonded to tubes by mechanical expansion of the tubes. The coil casing may be galvanized or stainless steel. Refer to the Product Data section of the submittal for the coil casing material.
Non-freeze, steam-distributing-type coils shall be provided. Steam coils shall be pitched in the unit for proper drainage of steam condensate from coils. The coils shall be proof-tested to 300 psig and leak-tested to 200 psig air pressure under water. Coil header connections are constructed of cast iron with female connections. Connections do not extend beyond unit casing. Inner tubes shall have orifices that ensure even steam distribution throughout the full length of the outer tube. Orifices shall be directed toward the return connections to ensure that the steam condensate is adequately removed from the coil. Coils are certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program which is based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table 1 of the Standard. Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Tube construction shall be a 11/16" OD, 0.031" [0.79mm] copper inner tube with a 1" OD, 0.031" [0.79mm] copper outer tube

ACCESS/INSPECTION / TURNING SECTION

A section shall be provided to allow additional access/inspection of unit components and space for field-installed components as needed. An access door shall be provided for easy access. All access sections shall be complete with a double-wall, removable door downstream for inspection, cleaning, and maintenance. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels, respectively. All doors downstream of cooling coils shall be provided with a thermal break construction of door panel and door frame.

Direct Drive Plenum Fan Section

The fan type shall be provided as required for stable operation and optimum energy efficiency. The fan shall be a single-width, single-inlet, multiblade-type direct-drive plenum fan. Motor bearing life of the direct-drive plenum fan shall be not less than L-10 250,000 hrs. *Refer to the Product Data section for fan quantity and number of blades selected within each unit.*

Fans that are selected with inverter balancing shall first be dynamically balanced at design RPM. The fans then will be checked in the factory from 25% to 100% of design RPM to insure they are operating within vibration tolerance specifications, and that there are no resonant frequency issues throughout this operating range. Inverter balancing that requires lockout frequencies inputted into a variable frequency drive to in order to bypass resonant frequencies shall not be acceptable. If supplied in this manner by the unit manufacturer, the contractor will be responsible for rebalancing in the field after unit installation. Fans selected with inverter balancing shall have a maintenance free grounding assembly installed on the fan motor to discharge both static and induced shaft currents to ground.

On units supplied with plenum fans, expanded metal door guard(s) shall be supplied on the access door(s) to the fan and those downstream access door(s) where unintended access to the plenum fan could occur. Door guard is intended to deter unauthorized entry and incidental contact with rotating components. *Refer to the Product Data section for fans with access door guard(s).*

High Performance Flow Meter
The fan shall have an airflow measurement system to measure fan airflow directly or to measure differential pressure that can be used to calculate fan airflow. The system shall predict airflow within +/- 5 percent total accuracy (device & transmitter) when operating within the stable operating region of the fan curve. On units supplied with multiple direct drive fans, one transducer is supplied for each fan in the array.The submitted fan airflow performance and noise levels shall not be affected by the installation of the device. Any device that provides an obstruction to the fan inlet will not be accepted.

Multiple VFDs, on a common panel, shall be provided for each fan array to provide redundancy in case of loss of function of one of the VFDs or fan motors. Individual VFDs shall be sized based on motor FLA to reduce overall panel input current. In the event of a VFD failure, the remaining VFDs must be capable of compensating and maintaining normal fan array operation. VFD panel shall have a common disconnect that is accessible from the outside of the unit. Disconnect shall open input power to all VFDs simultaneously. Disconnect shall be lockable in the off position. Disconnect shall utilize circuit breaker to provide overcurrent and short circuit protection. VFD panel shall be provided with a single point of field connection for field input power. Each VFD shall be supplied with independent input fusing, as required. VFDs shall be capable of onboard diagnostics to monitor individual fan motor performance. Externally mounted VFDs shall be provided with independent keypad.VFD panel shall be provided with a common point connection for speed input signal, start/stop signal, and fault status. Field safety interlock relay shall be field wired and provided

The supply fan's VFD shall be mounted internal of unit casing in the controls section. The internal enclosure shall be an integral part of the unit casing to allow for thermal venting to casing interior, but shall be accessible from unit exterior through access door. Internally mounted starters shall have doors with the same construction as other doors on unit. An external disconnect shall be mounted through the door to the VFD to disconnect full power from VFD.

Each fan in the multiple-fan array shall be provided with integral back flow prevention: a backdraft damper that prohibits recirculation of air in the event a fan or multiple fans become disabled. Dampers are tested and rated based on AMCA Standard 500. Dampers to be heavy duty type capable of a maximum back pressure that exceeds the design total static pressure with minimal leakage. The dampers should have a minimal total effect on airflow performance-both pressure drop when open and system effect on the fan. The damper blades and frame shall be extruded aluminum with blade edge seals locked into the blade edge. Adhesive type seals are unacceptable. AHU manufacturer responsible for providing proper spacing upstream of dampers to ensure full, uniform airflow through upstream components. For units where the damper(s) are supplied at the jobsite, the installing contractor shall contract a certified TAB contractor to verify uniform airflow thru upstream components. *Refer to Product Data for specific information on which sections are supplied with a backdraft damper.*

HUMIDIFIER SECTION (Direct Steam)
Humidifier section shall be provided with a humidifier panel designed for building steam. Humidifier panel shall include stainless steel construction of all wetted parts including the integrated header/separator and multiple tube dispersion assembly. Tube-to-header joints shall consist of welded stainless steel. Humidifier shall provide a uniform steam discharge. Humidifiers shall be provided with a control valve, inverted bucket steam trap, wye strainer, and two float and thermostatic steam traps shipped loose for field installation. All pipe connections shall be made from one side of the air handler.

Lifting Instructions

The air handling units must be rigged, lifted, and installed in strict accordance with the Installation, Operation, and Maintenance manual (CLCH-SVX013A-EN). The units are also to be installed in strict accordance with the specifications. Units may be shipped fully assembled or disassembled to the minimum functional section size in accordance with shipping and job site requirements.

Outdoor units shall be shipped on 7.25" integral base frame for the purpose of mounting units on a roof curb or field-supplied pier support system. Refer to the Product Data section for type of the base frame provided (for roof curb or pier-mount).

All units will be shipped with an integral base frame designed with the necessary number of lift points for safe installation. All lifting lugs are to be utilized during lift. The lift points will be designed to accept standard rigging devices and be removable after installation. Units shipped in sections will have a minimum of four points of lift.

Thermal Sensor

Resistance Temperature Characteristics			
Temperature	**Resistance**		**Temp Coeff**
	Min.	**Max.**	
-40°C	320.9K	369.0K	-6.61 % / °C
-25°C	125.6K	142.3K	-6.04% / °C
0°C	31.17K	34.6K	-5.16 % / °C
25°C	9.56K	10.44K	-4.40 % / °C
65°C	2.012K	2.158K	-3.5 % / °C

Specifications:
Probe to be permanently identified with the Trane part number.
Vendor part number and date code or lot code.

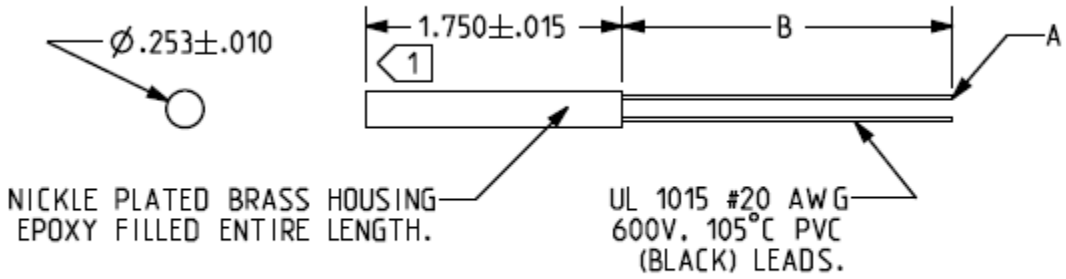

FIGURE 1

Thermal Sensor

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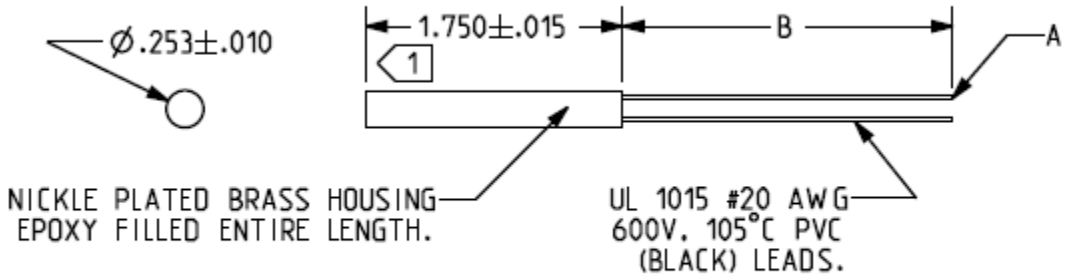
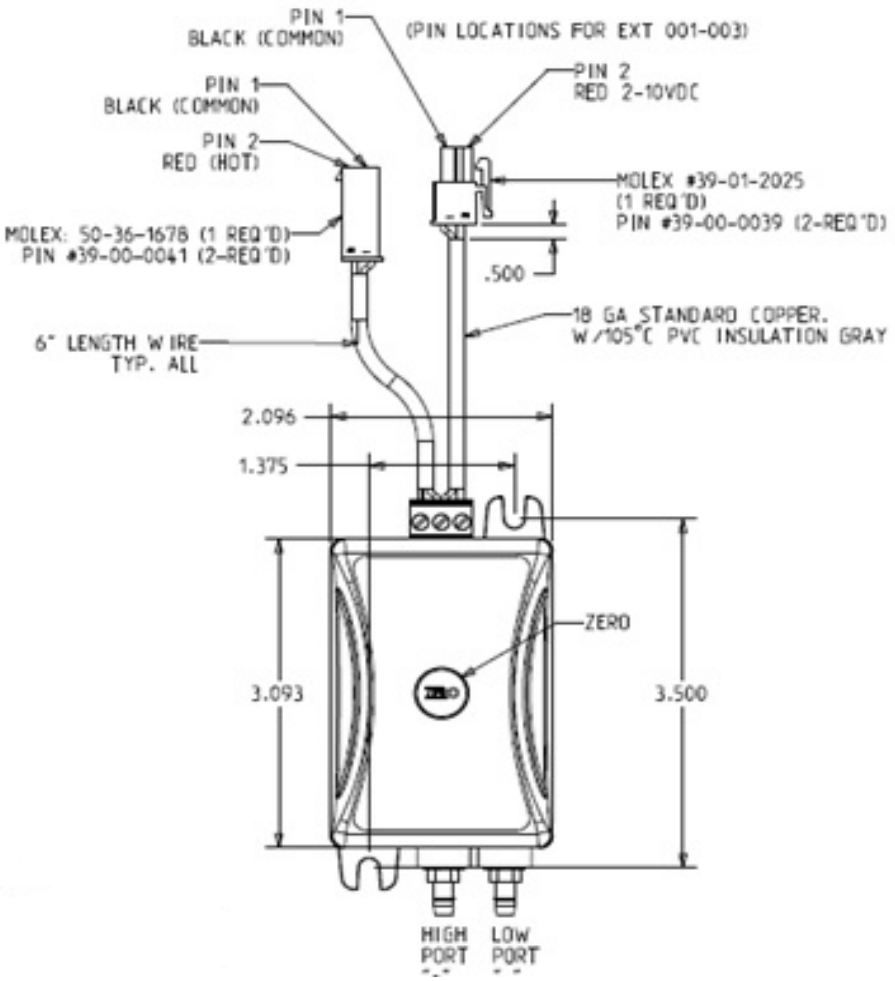
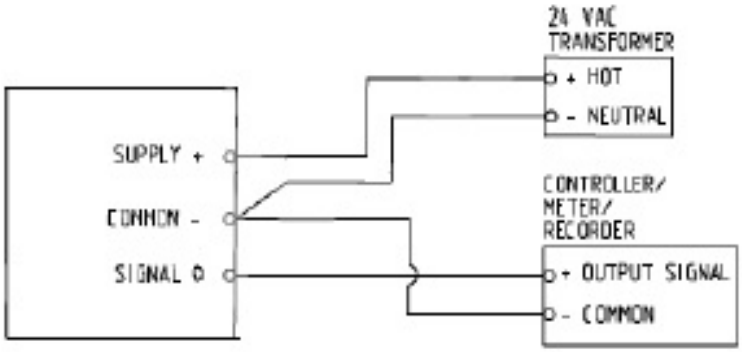


FIGURE 1



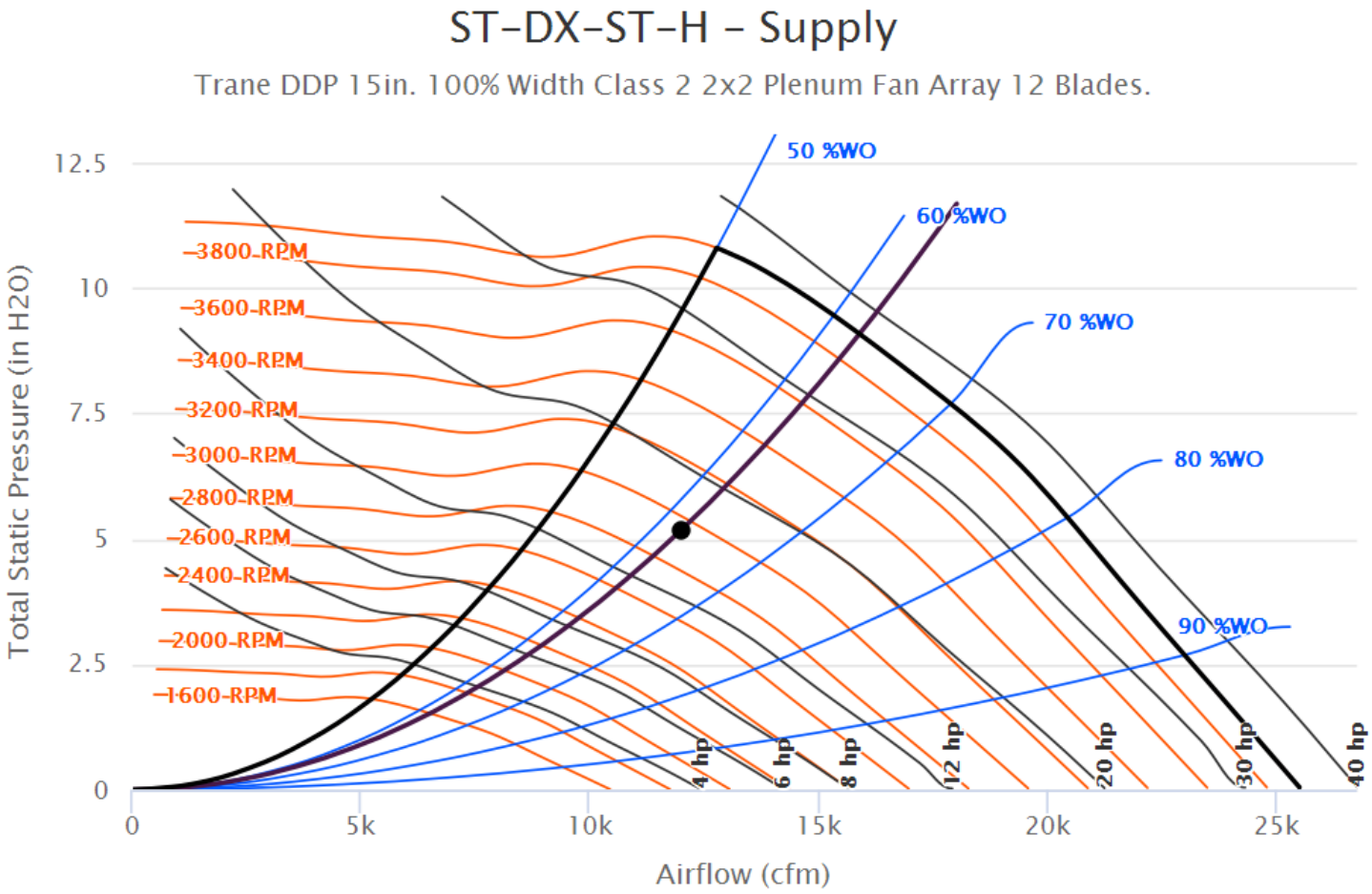


NOTE:

1. PRESSURE CONNECTIONS: 3/16" OD BARBED FITTING FOR ¼" TUBING
2. OPERATING TEMPERATURE: 0 - 85 C
3. COMPENSATED TEMPERATURE: 0 - 50 C
4. LOAD IMPEDANCE: 500 OHMS
5. TERMINATION: SCREW TERMINAL BLOCK
6. ACCURACY: 0.25%
7. INPUT VOLTAGE: 24VAC (NOMINAL)

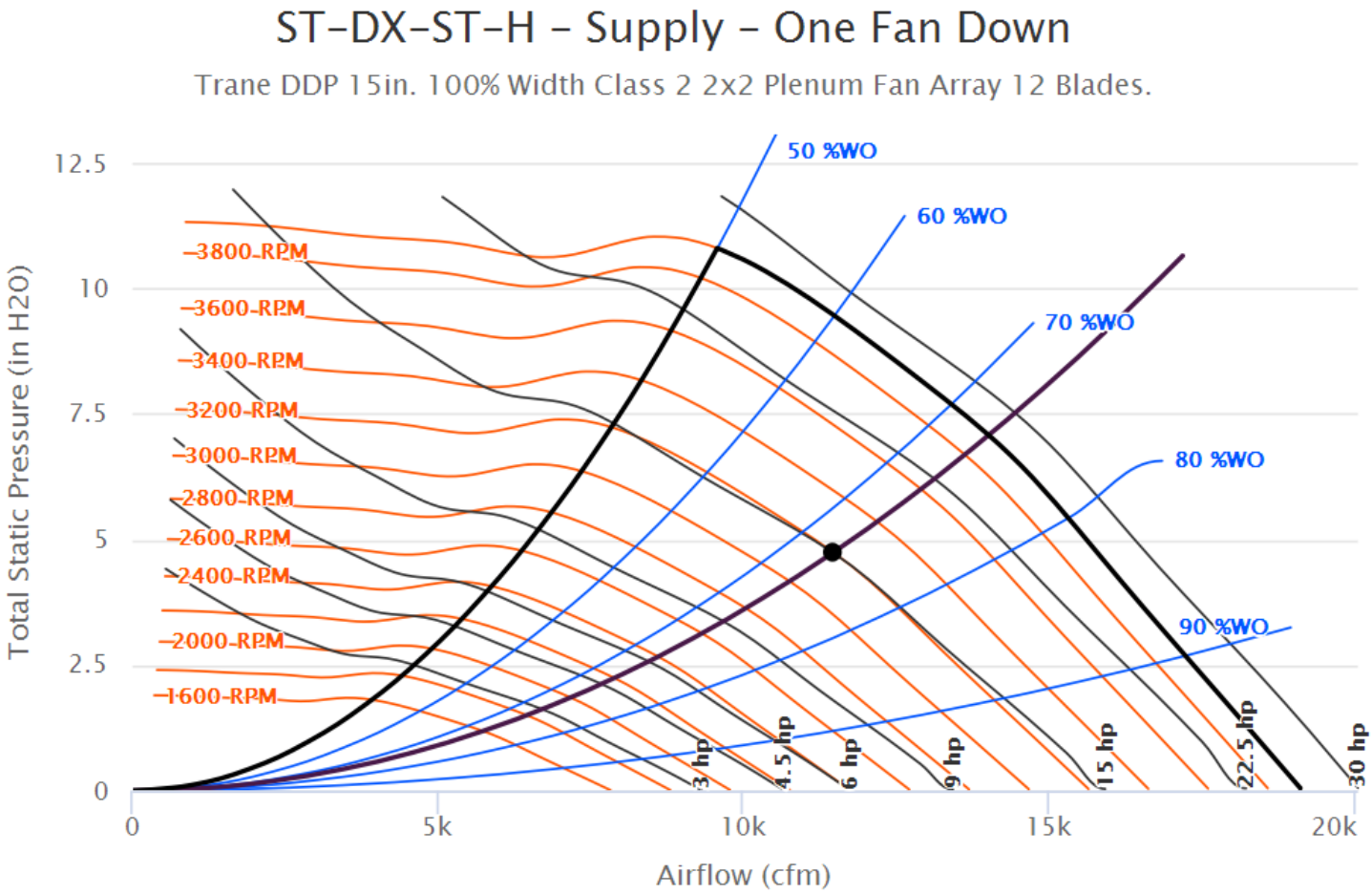
Fan Details

Unit Size	15TF	**Operating Brake Power**	16.042 hp
Motor Frequency	100.00 Hz	**Altitude**	0.00 ft
Operating Airflow	12,000 cfm	**Design Temp.**	70.00 F
Operating Static Pressure	5.192 in H2O	**Efficiency**	61.23 %
Operating RPM	2,949 rpm		



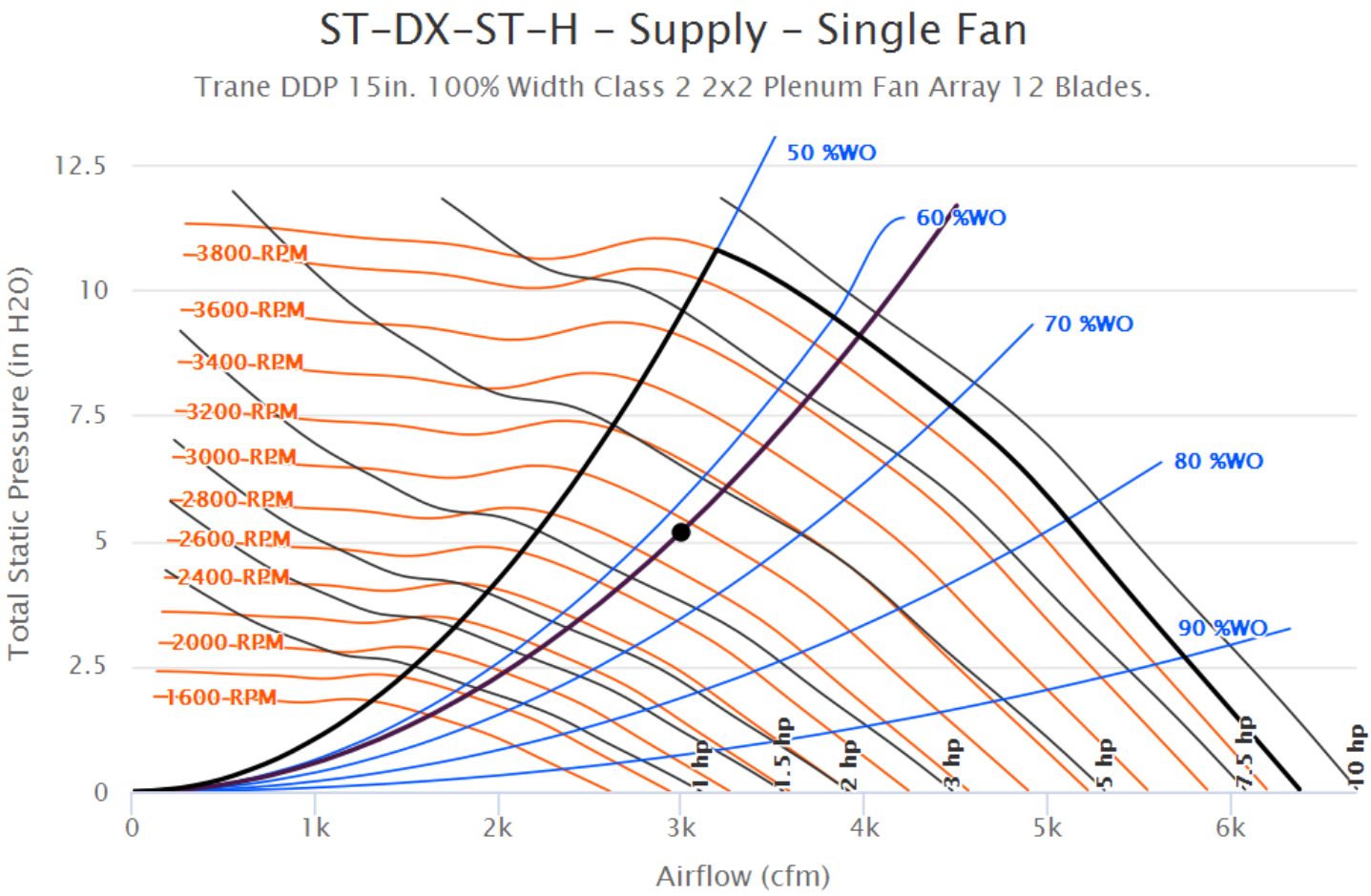
Fan Details

Unit Size	15TF	**Operating Brake Power**	15.000 hp
Motor Frequency	108.00 Hz	**Altitude**	0.00 ft
Operating Airflow	11,458 cfm	**Design Temp.**	70.00 F
Operating Static Pressure	4.733 in H2O	**Efficiency**	57.00 %
Operating RPM	3,194 rpm	**Redundancy**	95.48 %



Fan Details

Unit Size	15TF	**Operating Brake Power**	4.011 hp
Motor Frequency	100.00 Hz	**Altitude**	0.00 ft
Operating Airflow	3,000 cfm	**Design Temp.**	70.00 F
Operating Static Pressure	5.192 in H2O	**Efficiency**	61.23 %
Operating RPM	2,949 rpm		



SPLIT-AIR HANDLING UNIT SCHEDULE

AHU — BASIS OF DESIGN: TRANE

UNIT No.	LOCATION	AREA SERVED	TOTAL CFM	FAN DATA						ELECTRIC DATA PER SUPPLY FAN MOTOR (EACH)							DX-COOLING COIL								STEAM-HUMIDIFIER				
				NO. OF FANS	FAN TYPE	E.S.P. (IN. H20)	T.S.P. (IN. H20)	RPM	BHP	HP	VOLT/ Hz/PH	RPM	NO OF CIRCUIT	FLA (A)	MCA (A)	FUSE SIZE (A)	SENSIBLE CAPCITY (MBTU/HR)	TOTAL CAPCITY (MBTU/HR)	EAT. DB (°F)	EAT. WB (°F)	LAT. DB (°F)	LAT. WB (°F)	F.V. (FT/MIN)	A.P.D. (IN. H20)	REFRIGERANT TYPE	EAT. RH (%)	LAT. RH (%)	EAT. DB (°F)	STEAM FLOW (LB/HR)	COND. LOSS (LB/HR)
AHU-1	2ND FLOOR LOW ROOF	200-A,B&C, 201& 207	12,000	4	FEG75	3	5.17	2740	16	5	460/60/3	1800	1	32.8	34.85	40	487	886	92	76	55	54.9	452	0.64	R-410	25	50	78	287	19.16

SPLIT-AIR HANDLING UNIT SCHEDULE (CONTINUED)

BASIS OF DESIGN: TRANE

STEAM PRE-HEAT COIL								STEAM HEAT COIL								PANEL FILTER					OPERATING WEIGHT (LBS)	MODEL	REMARKS
TOTAL CAPCITY (MBTU/HR)	EAT. DB (°F)	LAT. DB (°F)	F.V. (FT/MIN)	AIR P.D. (IN. H20)	PRESSURE (°PSIG)	COND. (LB/HR)	STEAM .P.D. (IN. H20)	TOTAL CAPCITY (MBTU/HR)	EAT. DB (°F)	LAT. DB (°F)	F.V. (FT/MIN)	A.P.D. (IN. H20)	PRESSURE (°PSIG)	COND. (LB/HR)	S.P.D. (IN. H20)	TYPE	EFFICIENCY (%)	CLEAN P.D. (IN. H20)	DIRTY P.D. (IN. H20)	MEAN P.D. (IN. H20)			
650	0	50	474	0.09	5	677	8.581	585	50	95	474	0.106	5	609	6.9	PLEATED (MERV 13)	80	0.18	1	0.59	8500	PSCA	1-8

REMARKS:

1. EXTERNAL PIPE CABINET FOR STEAM VALVE.
2. SUPPLY FAN MOTOR: DIRECT DRIVE W/VFD.
3. BACNET I/P INTERFACE.
4. STAINLESS STEEL DRIP PAN.
5. SMOKE DETECTOR.
6. VFD PER FAN.
7. HUMIDIFIERS SHALL BE PROVIDED WITH A CONTROL VALVE, INVERTED BUCKET STEAM TRAP, WYE STRAINER, AND TWO FLOAT AND THERMOSTATIC STEAM TRAPS SHIPPED LOOSE FOR FIELD INSTALLATION.
8. STANDARD MANUFACTURER WARRANTY FROM DATE OF ACCEPTANCE BY CUNY.

PACKAGED AIR-COOLED CONDENSING UNIT

ACC — BASIS OF DESIGN: TRANE

UNIT NO.	UNIT SERVE	REFRIGERATION EFFECT (MBTU/HR)	CAPACITY (TON)	POWER (KW)	EER	SUCTION TEMP (°F)	AMBIENT TEMP (°F)	CONDENSER					ELECTRICAL DATA						WEIGHT (LBS)	REFRIGERANT	MODEL NO.	REMARKS
								COIL TYPE	FINS PER IN.	NO. OF CIRCUIT	FAN TYPE	QUANTITY	EMER. POWER (YES OR NO)	VOLT /PH/HZ.	MCA (A)	MOP (A)	RDE (A)	COMP. POWER (KW)	FAN POWER (KW)				
ACC-1	AHU-1	1121.31	80	102	11	44.0	95.0	ALUMINUM TUBE MICRO-CHANNEL	18	2	STANDARD	1	NO	460/3/60	174	200	175	95	7.04	5800	R410A	RCAUC80-1	1-3

REMARKS:

1. SPRING VIBRATION ISOLATORS
2. SUCTION SERVICE VALVE
3. BLEED THERMAL EXPANSION VALVE
4. STANDARD MANUFACTURER WARRANTY FROM DATE OF ACCEPTANCE BY CUNY.

CONDENSATE PUMP AND RECEIVER SCHEDULE

CP — BASIS OF DESIGN: SHIPCO PUMPS

UNIT No.	LOCATION	SERVICE	PUMP DATA					MOTOR DATA		RECEIVER CAPACITY (GAL.)	MODEL	REMARKS
			GPM (EACH)	DISCH. PRESS. (PSIG)	RPM	OPER. TEMP. (°F)	No. OF PUMPS	HP (EACH)	VOLT/ PH			
CP-1	REMSEN PIPE TUNNEL	AHU-1	3	30	3500	180	1	3/4	208/3	16	63 DSD-MU3	1-5

REMARKS:

1. STAINLESS STEEL CONSTRUCTION.
2. BASKET INLET STRAINER, GAUGE GLASS ASSEMBLY, DIAL THERMOMETER, DISCHARGE PRESSURE GAUGE, HIGH WATER ALARM SWITCH.
3. ALL UNIT SHALL BE COMPLETELY ASSEMBLED, PIPED, WIRED AND TESTED BEFORE SHIPMENT.
4. UNIT WILL BE FURNISHED WITH REMOVABLE SUPPORT STAND WHICH WILL ELEVATE RECEIVER 12" FROM BASE.
5. STANDARD MANUFACTURER WARRANTY FROM DATE OF ACCEPTANCE BY CUNY.

SPLIT AIR COOLED HEAT PUMP SYSTEM SCHEDULE

AC — BASIS OF DESIGN: MITSUBISHI

UNIT No.	LOCATION	AREA SERVED	CFM RANGE	TOTAL CAPACITY		POWER INPUT		CONDENSER									EVAPORATOR							DIMENSION WXDXH (IN.)	EFFICIENCY (SEER)	CONDENSING UNIT MODEL No.	EVAPORATOR MODEL No.	REMARKS
				COOLING (MBH)	HEATING (MBH)	COOLING (KW)	HEATING (KW)	MARK No.	CFM	OUTDOOR AIR D.B.	MIN. OPER. TEMP.	CONDENSER FAN MCA.	CONDENSER FAN MOCP	COMPRESSOR TYPE	COMPRESSOR RLA	COMPRESSOR LRA	COMPRESSOR MODEL No.	DIMENSION WXDXH (IN.)	E.A.T. D.B.	E.A.T. W.B.	COOLING L.A.T. D.B.	HEATING L.A.T. D.B.	MOTOR OUTPUT KW	MOTOR FLA	VOLT /PH/HZ.					
AC-R1	1ST FLOOR	RM 104	700	34.2	38	3.3	3.7	ACC-R1	3880	95°F	0°F	25	31	INVERTER	8	13	MNB33FBRMC-L	42X17X56	95	76	75	70	0.56	0.57	208/1/60	51X19X15	18.8	PUZ-A36NHA (BS)	PKA-A36FA	1-5

REMARKS:

1. LINESET-TWIN TUBE-INSULATION
2. HEAVY DUTY WALL MOUNTING BRACKET FOR OUTDOOR UNIT-COATED STEEL. MODEL-QSWB200M-1
3. BACKNET AND MODBUS INTERFACE
4. FLARED CONNECTION.
5. WARRANTY- 5 YEARS FROM THE DATE OF ACCEPTANCE FROM CUNY.

EXHAUST FAN SCHEDULE

EF — BASIS OF DESIGN: STROBIC AIR

ITEM NO.	UNIT NO.	AREA SERVED	LOCATION	NO OF FAN	LABORATORY EXHAUST (CFM)	STATIC PRESSURE IN WG	FAN (RPM)	INLET FLOW RATE (CFM)	BYPASS FLOW (CFM)	ENTRAINED FLOW (CFM)	POWER	EMER. POWER (YES OR NO)	SINGLE FAN PERFORMANCE						MODEL NO.	OPERATING WEIGHT	REMARKS
													BHP	HP	FAN FLOW RATE (CFM)	TOTAL FLOW RATE (CFM)	NOZZLE VELOCITY (CFM)	DILUTION RATIO (%)			
1	EF-1A&1B	200-A,B&C, 201, 207 000, 000A, 000B	ROOF	2	15,000	2.5	1200	15,000	1818	10090	460/3/60	NO	7	7.5	8400	13454	4426	179	TS2S075A12	5088	1 THRU 8

REMARKS:

1. FAN SHALL BE SPARK RESISTANT AND EXPLOSION PROOF CONSTRUCTION.
2. ISOLATION MOTORIZED DAMPER.
3. BYPASS MOTORIZED DAMPER.
4. BYPASS RAIN HOOD.
5. MIXING PLENUM.
6. DISCONNECT SWITCH/FAN.
7. OUTLET NOZZLE SILENCER.
8. STANDARD MANUFACTURER WARRANTY FROM DATE OF ACCEPTANCE BY CUNY.

REGISTERS AND DIFFUSERS

BASIS OF DESIGN: TITUS

TYPE	CFM RANGE	NECK SIZE	NOMINAL FACE SIZE	MODEL No.	REMARKS
CD-1	100-180	7"ø	24"X24"	TLF-SS	1
CD-2	100-180	7"ø	24"X48"	TLF-SS	1
CD-3	190-300	10"ø	24"X48"	TLF-SS	1
ER-1	100-300	10"x10"	12"X12"	PAR-SS	1
ER-2	100-300	10"x10"	24"X24"	PAR-SS	1
ER-3	300-550	12"x12"	24"X24"	PAR-SS	1

REMARKS:

1. STAINLESS STEEL

DUCT SILENCER

S — BASIS OF DESIGN: VIBRO-ACOUSTICS

UNIT NO.	AHU TAG	LOCATION	NO	FLOW RATE (CFM)	STATIC PRESSURE IN WG	PD IN WG	DIMENSION LXWXH (IN.)	MIN. INSERTION LOSS								MANUFACTURER	MODEL NO.	OPERATING WEIGHT	REMARKS
								63	125	250	500	1000	2000	4000	8000				
S-1	AHU-1	LOWER ROOF	1	12,000	0.29	0.26	84X36X30	9	14	19	22	31	28	23	20	VIBRO-ACOUSTICS	TS2S075A12	325	1 THRU 5

REMARKS:

1. FOR NON BASIS OF DESIGN, PROVIDE P.E STAMP CALS TO PROVIDE 20 DB REDUCTION IN THE VIVARIUM LABS.
2. FOR NON BASIS OF DESIGN, PROVIDE P.E STAMP CALS TO PROVIDE PRESSURE DROP WITH SYSTEM EFFECTS.
3. REFL – RECTANGULAR ELBOW FILM LINED SILENCER WITH G90, 18 GA. CASING AND 22 GA. PERF MATERIAL CONSTRUCTION.
4. VIBAR FILM LINING INCLUDED. VIBAR FILM IS FIRE/SMOKE RATED AND MEETS NFPA 90A AND ASTM E84 STANDARDS.
5. FOR NON BASIS OF DESIGN, CONTRACTOR IS RESPOSNSIBLE FOR MEETING THE REQUIRED DB REDUCTION.

ELECTRIC AIR HANDLING UNIT SCHEDULE

AHU — BASIS OF DESIGN: TRANE

UNIT No.	LOCATION	AREA SERVED	TOTAL CFM	COOLING COIL DATA							HEATING COIL DATA			FAN DATA						ELECTRICAL DATA						MODEL	DIMENSION LXWXH (FT.)	WEIGHT (LBS)	SOUND (dBA)	EER	REMARKS
				ENT. DB (°F)	ENT. WB (°F)	LAT. DB (°F)	LAT. WB (°F)	TOTAL COOLING MBTU/HR	SEN. COOLING BTU/HR	MIN. ROWS DEEP	HEATING CAPACITY KW	EAT (°F)	LAT (°F)	STATIC PRESS. (IN.W.G.)	RPM	HP	RPM	BHP	DISCHARGE CONFI.	EMER. POWER (YES OR NO)	HP	VOLT /PH/HZ.	MCA (A)	MFS (A)	FLA (A)						
AHU-3	FIRST FLOOR	CAGE AREA	2000	92	76	55	54.9	138	79	6	48	0	83	2.24	1944	1.5	1800	1	VERTICAL	NO	1.5	460/3/60	84.8	90	67.8	HORIZON OADG010A3	14X5X6	3050	88.7	13.1	1-13

REMARKS:

1. HEAT: FIN & TUBE MODULATING HGRH ELECTRIC.
2. ELECTRIC HEATING COIL WITH SCR(MODULATING CONTROL).
3. SUPPLY FAN MOTOR: DIRECT DRIVE W/VFD.
4. UNIT CONTROLLER- TRANE TD7- DISCHARGE AIR CONTROL. W/BACNET W/DISPLAY.
5. COOLING CONTROL- RELIATEL.
6. STAINLESS STEEL DRIP PAN.
7. SMOKE DETECTOR.
8. SPACE TEMP THERMOSTAT.
9. HORIZONTAL DISCHARGE CURB-PRIMARY CABINET.
10. ADJUSTABLE DISCHARGE AIR TEMP. CONTROL.
11. FILTER- MERV-13.
12. SOUND ATTENUATION PACKAGE.
13. STANDARD MANUFACTURER WARRANTY FROM DATE OF ACCEPTANCE BY CUNY.

CONSTRUCTION DUCUMENTS — FULL SCALE DWG. SIZE 30"x42"

NEW YORK STATE OF OPPORTUNITY. DASNY
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STRUCTURAL ENGINEERS
32 OLD SLIP, 10TH FLOOR, NEW YORK, N.Y. 10005
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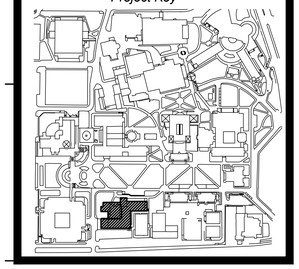
Project Key



REVISIONS

Rev No	Description	Date:
1	CONSTRUCTION DOCUMENTS	12-19-19
2		
3		

DOB JOB #

Client
CUNY
THE CITY UNIVERSITY OF NEW YORK
555 WEST 57th STREET
NEW YORK, NEW YORK, 10019

Project Title
QUEENS COLLEGE
REMSEN HALL VIVARIUM SWING SPACE & ASBESTOS WORK
66-50 KISSENA BLVD.,
FLUSHING, NY 11367

Drawing Title
SCHEDULE SHEET

Drawn By:	Checked By:	Approved By:	Date:
E.S.	G.S.	G.S.S.	08/30/2019

Seal & Signature

GENESYS Project No: 0361.22-100
DASNY Project No: 3066809999
Drawing Number
M-900.00
Drawing ## of ##