

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

PRE-PURCHASE SPECIFICATIONS AIR HANDLING UNITS

PART 1 - GENERAL

1.01 SCOPE

- A. The purpose of this specification is to pre-purchase air handling units. The rigging of the equipment and accessories to their final location, installations, connections, and power and controls, will be provided by the installing contractor.
- B. In addition to furnishing the air handling units, the vendor shall include the following items on its bid pricing:
 - 1. Shipping and handling costs FOB site.
 - 2. Knock-down “build in place” construction assembly.
 - 3. AHU inspection
- C. The following items shall not be part of this pre-purchase bid, but shall be included in Phase 1 of the library project:
 - 1. Inspection and adjustment of fan assemblies.
 - 2. Start-up service and Owner training
 - 3. Field performance verification

1.02 OWNER AND LOCATION

- A. The term Owner refers to Rowan University, 201 Mullica Hill Road, Glassboro, NJ 08028
- B. The term Site refers to the Campbell Library, Rowan University, 201 Mullica Hill Road, Glassboro, NJ 08028

1.03 ACCEPTANCE OR REJECTION OF PROPOSALS

- A. The Owner, in its sole discretion, may waive any informality in any proposal, may accept any proposal or may reject any or all proposals. The Owner shall announce the successful manufacturer within seven (7) days after opening of proposals, but such announcement shall not be construed as a rejection of any other proposal. The accepted manufacturer shall promptly execute the Contract and all related documents, which shall be prepared by the Owner. Upon failure of the accepted manufacturer to execute such documents within four (4) business days after they have been presented for execution, such manufacturer shall be disqualified.

1.04 ASSIGNMENT OF CONTRACT AND PAYMENT

- A. The Owner reserves the right to assign this Contract to the installing contractor for coordination and administration. In no event shall the responsibility of the manufacturer, toward the Owner, as specified, be abrogated. The manufacturer shall agree to terms and conditions in the Owner's, purchase order agreement and conditions specified herein.
- B. The manufacturer shall invoice for payment at time of shipping and Owner shall issue payment up to 90% of invoiced amount. The remaining 10% of the invoice shall be retained until acceptance by Owner.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

1.05 CODES, RULES, PERMITS AND FEES

- A. Nothing contained in this specification shall be so construed as to conflict with the standards of the National Fire Protection Association, International Code Council, Buildings, Mechanical, Electrical, and Energy Codes, or any local, municipal, State or Federal regulation governing the installation of the equipment specified herein, and the requirements of same. All such laws, ordinances and regulations, where they apply to this work, are hereby incorporated into and made a part of this Specification. Where applicable, materials and equipment shall bear stamps or seals of UL, IEEE, NEMA, ANSI, ASME, and other industry regulating groups. In case of difference between governing codes, specifications, laws, ordinances, industry and utility regulations, or contract documents, the most stringent shall govern. The manufacturer shall promptly notify the Owner, in writing, of such differences.

1.06 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new, shall bear manufacturer's name and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended.
- B. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage.
- C. No change in character or make of the material specified herein will be permitted at any time after the proposals are received. Manufacturers wishing changes must make written application to the Owner at least four (4) days prior to the time of closing of bids, and if such changes are approved by the Owner, each manufacturer who is involved will be so notified.

1.07 PROPOSAL REQUIREMENTS

- A. The Proposal to the Owner shall include preliminary drawings and performance data, sufficient to demonstrate that the physical sizes and unit performance capacities can be met. Dimensions and performance requirements are indicated on Drawing M603 in the Construction Contract Documents.
- B. Failure to provide dimensional drawings or unit sizes and configurations that vary from design requirements may result in disqualification of the bid as installation space is limited.

1.08 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of 25 years of experience in designing, manufacturing, and servicing air-handling units.
- B. The design indicated on the schedules and shown on the drawings is based upon the products of the named manufacturer. Alternate equipment manufacturers are acceptable if equipment meets scheduled performance requirements and dimensional requirements.

1.09 RATINGS AND CERTIFICATIONS

- A. Units shall conform to:
1. AMCA (Air Movement and Control Association) Standard 99
 2. AMCA 210 and 211 for fan performance ratings.
 3. AMCA Standards 300 and 311
 4. AMCA Standard 500

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

5. AHRI (Air-Conditioning, Heating and Refrigeration Institute) Standard 410
6. ASHRAE/ANSI (American Society of Heating, Refrigerating and Air-Conditioning Engineers/American National Standards Institute) Standard 111
7. ASHRAE Standard 52
8. ANSI/ASHRAE 15
9. UL (Underwriters Laboratories) Standard 1995
- B. Unit shall conform to E.T.L. standards. Unit shall be ETL listed.
- C. Unit sound ratings shall be reported in accordance with AHRI 260 for inlet and discharge sound power levels.
- D. Unit casing radiated sound ratings shall be reported in accordance with ISO 9614 parts 1&2 and ANSI S12.12.
- E. Unit shall conform to AHRI 410 for capacities, pressure drops, and selection procedures of air coils.
- F. Unit shall have airflow performance certified to ANSI/AHRI 430.
- G. Motors covered by the Federal Energy Policy Act (EPACT) shall meet EPACT requirements.
- H. Damper performance shall comply with AMCA 500.
- I. Airflow Monitoring Stations shall be rated in accordance with AMCA 611-95 and bear a Certified Ratings Seal for Airflow Measurement Performance.
- J. Units shall be ISO 9001 certified.
- K. Units shall be manufactured in an ISO 9002 certified facility.
- L. Filter media to comply with ANSI/UL 900 listed Class I or Class II.
- M. Control Wiring comply with NEC codes & ETL requirements.
- N. Units shall comply with energy use AHSRAE 90.1.

1.10 SUBMITTAL DOCUMENTATION REQUIRED

- A. Submittals shall include the following:
 1. Unit drawings include plan and elevation views.
 2. Ladder type schematic drawing of power, control, and auxiliary utility field hookups, indicating all items that are furnished by the manufacturer.
 3. Manufacturer's performance data for each unit. As a minimum the following shall be provided:
 - a. Model number of unit
 - b. Unit dimensions
 - c. Approximate unit shipping weight
 - d. Rated load amps
 - e. Fan performance
 - f. Coil performance
- B. Furnish fan performance ratings and fan curves with specified operating point clearly plotted.
- C. Furnish drawings indicating unit dimensions, required clearances, field connection locations, wiring diagrams, shipping drawings, and curb drawings.
- D. Furnish performance report showing unit level performance data including: fan(s), motor(s), coil(s) and other functional components. Performance report shall also include unit casing performance.
- E. Furnish operation and maintenance data, including instructions for lubrication, filter replacement, motor and drive replacement, and condensate pan cleaning; spare parts lists, and wiring diagrams.
- F. Adjust and report performance ratings for the proper altitude of operation.
- G. Report air-handling unit performance ratings in accordance with ANSI/AHRI-430 (static pressure, airflow, fan speed, and fan brake horsepower).
- H. Report static pressure profiles by component section.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- I. Report coil ratings in accordance with AHRI-410 (capacities and pressure drops).
- J. Report unweighted octave band AHU sound power for inlets and outlets rated in accordance with AHRI Standard 260. Provide eight data points, the first for the octave centered at 63 Hz, and the eighth centered at 8,000 Hz. Manufacturer shall not use sound estimates based on bare fan data (AMCA ratings), nor use calculations like the substitution method based on AHRI 260 tests of other AHU products. Provide data for inlets and outlets as scheduled. Report unweighted casing radiated sound power over the same 8 octave bands in accordance with ISO 9614 Parts 1&2 and ANSI S12.12.
- K. Airflow measuring device performance shall be certified and rated in accordance with AMCA-611. Report data in accordance with AMCA-611. Provide AMCA Certified Rating Seal for Airflow Measurement Performance.
- L. Report panel deflection at +/-8" w.g., stated in terms of 'L/X' where 'L' is the casing panel length and 'X' is a constant provided by the AHU manufacturer.
- M. Report casing leakage rate at +/-8" w.g., specified in terms of percentage of design airflow.
- N. Report weight loads and distributions by component section.
- O. Report product data for filter media, filter performance data, filter assembly, and filter frames.
- P. Report electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- Q. Report motor electrical characteristics.

1.11 QUALIFICATIONS

- A. Manufacturer shall specialize in the design and manufacture of commercial and industrial custom air-handling equipment.
- B. Units shall bear the ETL or UL label.

1.12 OPERATING INSTRUCTIONS

- A. Manufacturer shall include with the equipment electronic copies of assembly and/or installation instructions, parts lists, and periodic maintenance instructions, for all equipment being purchased. These materials shall accompany the equipment and be clearly identified.
- B. Manufacturer shall provide assembly training by a factory certified instructor regarding disassembly/reassembly of the units as required for rigging. Training shall be for a minimum of 4 hours and a maximum of 8 hours.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. All indoor units shall be shipped completely covered in a polymer covering.
- B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish. All fans must be periodically rotated during storage period per manufacturer recommendation.

1.14 WARRANTY

- A. The complete unit shall be covered by a parts warranty issued by the manufacturer covering the first year of operation from the date of start-up or eighteen months from date of shipment, whichever comes first.
- B. The installing contractor shall provide labor warranty during the unit's first year of operation.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

1.15 GUARANTEE

- A. Manufacturer shall guarantee all labor and materials for a period of one year for operation, which shall include agreement to repair, replace in location, and make good at his expense, any and all defects which may appear in his work or materials during that time which, in the judgment of the Owner, arise from defective workmanship or imperfect or inferior materials. The guarantee period shall start after the installation of the equipment is complete and accepted by the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Carrier Custom (39CC)

2.02 MASTER CONTROL DOCUMENT FOR MANUFACTURING

- A. The approved submittal shall be the final document for manufacturing. The approved submittal shall supersede any other specifications.
- B. Except for approved submittals, any changes to a unit shall be made in writing.

2.03 CABINET CONSTRUCTION

- A. Cabinets shall be constructed in a watertight and airtight manner. The manufacturer's standard cabinet construction shall result in an ASHRAE/ANSI Standard 111 Leakage Class of less than six (6) at 1.5 times the cabinet operating pressure.
- B. Unit Base: Each unit shall be constructed on a base fabricated from ASTM (American Society for Testing and Materials) A36 welded structural steel channel. Tubular or formed metal channel bases are not acceptable. Channel bases shall be sized as a function of air handling length as follows:

AIR HANDLER UNIT LENGTH	MINIMUM CHANNEL SIZE	
	Dimensions	Weight
Up to 10 ft	4 in. x 1 ⁵ / ₈ in.	(5.4 lb/lin. ft)
11 ft to 20 ft	6 in. x 2 in.	(8.2 lb/lin. ft)
21 ft to 30 ft	8 in. x 2 ¹ / ₂ in.	(11.5 lb/lin. ft)
31 ft to 50 ft	12 in. x 3 in.	(20.7 lb/lin. ft)

Heavy removable lifting lugs shall be added to the perimeter channel along the longest dimension of the unit. Units constructed with aluminum or stainless steel may require different base specifications.

- C. Floor Construction:
 1. The floor shall be supported by structural steel members. Maximum spacing of floor support

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- shall be 24-in. centers. These supporting members shall be welded to other members for maximum strength.
2. Floor skin shall be welded with standing seams and drive cleats to maintain water and air-tight seal. The flooring shall be welded to the members below. No penetrations through the floor skin are acceptable. Welds shall be below the floor and spaced no greater than 6 in. on center.
 3. Fans, coils, and major components shall be supported with structural steel members.
 4. Floors shall be double wall and insulated with a water-impervious spray foam insulation.
 5. Floor sheet construction options include:
 - a. 16 gage, bright galvanized zinc coating
 - b. 10 gage, bright galvanized zinc coating
 - c. 16 gage 304 stainless steel
 - d. 16 gage 316 stainless steel
 - e. 3/16 in. OD aluminum tread plate
 - f. 10 gage smooth aluminum
(Other thicknesses are available.)
 6. Floor liner shall be 20 gage galvanized zinc coated.
- D. Unit Housing Side and Roof Panels:
- E. Side and roof panel construction options include:
1. 16 gage galvanized steel (painted)
 - a. 16 gage G-90 galvanized steel
 - b. 16 gage 304 stainless steel
 - c. 16 gage 316 stainless steel
 - d. 16 gage high strength aluminum
 - e. 18 gage galvanized steel (painted)
 - f. 18 gage 304 stainless steel
 - g. 18 gage 316 stainless steel
 2. Unit housing side and roof panels shall utilize a standing seam modular panel type construction. The panels shall be caulked and attached to each other, to the roof, and to the floor using nuts and bolts. Drive screw attachment is not acceptable. All sections of panels shall be removable.
 3. All seams shall be sealed with an acrylic latex sealant prior to assembling the panels and after completion of the assembly.
 4. All floor openings shall have a steel frame and 16 gage flange around the entire perimeter of opening for duct connections.
 5. Optional outdoor construction finish: After panels are formed, they shall be coated with an industrial-grade, high-solids polyurethane or powder coat suitable for outdoor construction, color by architect. All fan bases, springs and structural steel supports shall be coated with similar finish. The paint system shall meet ASTM B117 salt spray test for a minimum of 1,000 hours in a 5% solution.
 6. Optional indoor unit finish: Indoor units and components inside the unit may be coated with industrial grade enamel paint.
- F. Insulation Options:
1. Panel and insulation thickness to be 2, R value of 6.5/in. foam insulation with a 2.2 lb/ft³ density. Insulation shall meet NFPA (National Fire Protection Association) 90A smoke and flame spread requirements. There shall be no raw edges of insulation exposed to the airstream.
 2. Panel insulation may be a foam board insulation with a minimum R value of 6.5/in.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- G. Thermal break construction is provided for the entire unit.
- H. Panel Liner Options:
1. 20 gage galvanized, zinc coating
 2. 20 gage, 304 stainless steel
 3. 20 gage, 316 stainless steel
 4. 16 gage, solid aluminum
 5. 20 gage, perforated galvanized, zinc coated
 6. 20 gage, perforated 304 stainless steel
 7. 16 gage, perforated aluminum
 8. 22 gage, perforated galvanized, zinc coated
 9. 22 gage galvanized, zinc coating
 10. 22 gage, 304 stainless steel
 11. 22 gage, 316 stainless steel
- I. Access Doors:
1. Hinged, double wall, insulated (foam injected, 2.2 lb/ft³), man-size access doors shall be provided in all sections requiring access for maintenance or service.
 2. Access doors shall be fully gasketed with a closed-cell, replaceable neoprene gasket. The gasketing material shall be installed to allow for easy removal and replacement.
 3. Door hinges and latches shall be easily adjustable, without the use of shims or special tools, to allow for a tight seal between the door and the door frame as the gasketing material compresses over time. The door hinge design shall allow for field modification of door swing and doors shall be easily removable. A door detail drawing is provided with submittal package.
 4. Latches shall utilize phenolic knurled knobs. When required, the latch assembly can incorporate a built-in safety catch to release cabinet operating pressure prior to opening the door.
 5. Doors entering into any section of the air handler that contains rotating fans shall be provided with zinc-plated nuts in lieu of knurled knobs. The nuts shall limit access to personnel with proper tools.
 6. Window option: A 10 in. x 10 in. wire-reinforced glass view window may be provided in each fan access door.
 7. A door switch shall be interlocked with fan starter or VFD to stop the fan before access door is opened. If motor controls are not included, the door switch will not be provided.
- J. Drain Pans:
1. Drain pans shall be constructed from 16-gage, 304 or 316 stainless steel. Galvanized steel drain pans are not acceptable.
 2. The drain pan shall be insulated with 2.0-in. foam insulation to prevent condensation under the drain pan. Insulation shall be protected with a 20-gage galvanized steel liner.
 3. Drain pans must be sized such that the entire coil, including headers and return bends, are inside the drain pan.
 4. Drain pans must slope in two directions so there is no standing water in drain pan. Stainless steel condensate connection shall be provided on one side of the unit. The coil drain pan is designed to prevent immersion of the coil in condensate and allow for complete cleaning of drain pan beneath the coils.

2.04 FAN ASSEMBLIES

- A. Fans are licensed to bear the AMCA seal for Sound and Air performance and FEG. The ratings

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

shown are based on tests and procedures performed in accordance with AMCA publication 211 and AMCA publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

- B. The sound power level ratings shown are in decibels, referred to 10-12 watts, calculated per AMCA International Standard 301.
- C. Free-running Cpro impeller made of ZAmid high-performance composite material with 7 backward-curved, fluted blades.
- D. Bolted supporting structure made of galvanized sheet steel or of sheet steel with an epoxy/ polyester powder coating RAL 7032
- E. Galvanized components can be coated with epoxy/ polyester powder coating RAL 7032 for a surcharge.
- F. Inlet ring designed for optimum air flow, made of galvanized steel sheet with measuring device for determination of flow rate.
- G. GR modules for compact installation in customer applications/devices for horizontal and vertical air feed.
- H. AC motor from mass production manufacturers (IEC or NEMA standard) and shall be either IE2-IE3 or NEMA Premium Efficiency

2.05 COILS

- A. Chilled Water and Hot Water Coils:
 - 1. Coils shall be of the plate fin extended surface type. Tubes shall be 5/8-in. outside diameter seamless copper with a 0.020 in. (optional 0.025 in., 0.035 in., or 0.049 in.) minimum wall thickness. Tubes shall be expanded into the fin collars to provide a permanent mechanical bond. Coil fins shall be plate-type, die formed corrugated 0.0075 in. (optional 0.010 in.) aluminum, or optional 0.0060 in., 0.0075 in., or 0.010 in. copper, and shall be spaced not closer than 12 fins per inch with integral spacing collars that cover the tube surface. Headers shall be non-ferrous seamless copper, outside the air stream and provided with brazed copper male pipe connections. Drain and vent tubes shall be extended to the exterior of the air-handling unit.
 - 2. Cooling coil casings shall be of minimum 16-gage 304 stainless steel with double formed 1 1/4 in. stacking flanges and 3/4 in. flanges on the side plates. All other coil casings shall be of 16-gage galvanized (optional stainless) steel. Tube holes with raw sheet metal edges are not acceptable. Reinforcing shall be furnished so that the unsupported length is not over 60 inches. All coil assemblies shall be tested under water at 300 psig and rated for 150 psig working pressure. Headers are to be located inside the cabinet casing with only the pipe connections extending through the casing. All sides of coils shall be carefully blanked off to ensure all air passes through the coil.
- B. Tubes and Return Bends:
 - 1. These shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed, with a maximum grain size of 0.040 mm. Tubes are to be mechanically expanded into fins. Materials are to be 5/8 in. diameter x 0.025 (optional 0.035 or 0.049) in. wall thickness, or 1 in. diameter x 0.035 in. (optional 0.049 in.) wall thickness.
- C. Fins:
 - 1. Secondary surface fins shall be of the plate-fin design using aluminum or copper, with die-formed collars. Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

of oils and oxidation.

D. Headers:

1. Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. (Optional: Type K [drawn] copper headers or Schedule 40 steel headers).
2. Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sizes up to 1 3/8 in.).
3. Coil casing material shall be 16 gage G90 galvanized (optional stainless) steel. Coil casings on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.

2.06 FILTERS

A. Construction:

1. Filter sections shall be fabricated as part of the air-handling unit.
2. Filters shall be arranged for upstream, downstream, or side loading as shown on the drawings.
3. Filter-holding frames are provided to accommodate scheduled filters. Filter frames shall be 16 gage galvanized (optional 304 stainless) steel and shall be welded to reduce leakage of air through corners.
4. A Dwyer Magnehelic Series 2000 pressure gage is factory-installed at each filter bank, complete with static pressure taps when required, hardware and fittings. The gage is enclosed in a 304 stainless steel protective weatherproof box with a hinged inspection door for outdoor units. Magnehelic gages for indoor units are mounted using a sheet metal mounting plate.

2.07 DAMPERS AND LOUVERS

A. Dampers:

1. Dampers shall be supplied with low leak extruded aluminum airfoil blades. Blades shall be supplied with rubber edge seals and stainless steel arc end seals. Rubber edge seals shall be backed by the damper blade to assure a positive seal in the closed position. Dampers shall be provided with nylon bearings within extruded openings.
2. Damper leakage shall not exceed 8 cfm/ft² at 4.0 in. of static pressure. Leakage testing shall be in accordance with ANSI/AMCA standard 500-D. Test results must be from an independent testing laboratory.

B. Louvers:

1. Louvers for outside air and exhaust air are provided for units located outdoors. Outside air louvers shall be sized for a maximum face velocity of 450 ft/min based on gross louver face area. Louvers shall have zero water penetration at 600 ft/min air velocities.
2. Maximum louver pressure drop shall be 0.03 in. wg at 500 ft/min. Test results are provided from an independent testing laboratory. Test must be conducted in accordance to AMCA Standard 500 Figure 5.5.
3. Louver water carry over must be less than 0.01 oz./ft² at 1100 ft/min. of free louver face area. Test must be conducted by independent testing laboratory per AMCA 500-89 Figure 5.6.
4. Hoods may be used instead of louvers where necessary.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

2.08 AIRFLOW MEASURING STATIONS

A. Flow Measuring System:

1. Fans shall be supplied with a complete flow measuring system capable of supplying a 4 to 20 mA. output signal to the EMS (energy management system) that is proportional to airflow. The flow measuring station and a flow transmitter shall be factory mounted.
2. The flow measuring station shall consist of pressure taps located in the inlet cone of each fan. A cfm scale gage that indicates the fan volume is mounted on the external side of the fan sections.

B. Transmitter:

1. The electronic flow transmitter shall be mounted on the exterior of the fan section. It shall be capable of receiving signals of total and static pressure from a flow element, of amplifying, extracting the square root, and scaling to produce a 4 to 20 mA or 0 to 5 vdc output signal, linear and scaled to air volume or velocity. The flow transmitter shall be capable of the following performance and application criteria:
 - a. Calibrated spans from 0 to 896 ft/min., in 8 flow range increments.
 - b. Output signal 4 to 20 mA or 0 to 5 vdc standard. Integral zeroing means 3-way zeroing valve with manual switch.
 - c. Temperature effect $\pm 2.0\%$ of full span from 40 to 120 F.
2. The transmitter shall not be damaged by over-pressurization up to 200 times greater than span, and shall be furnished with a factory-calibrated span and integral zeroing means.
3. The transmitter shall be housed in a NEMA 12 enclosure if mounted on the outside of the unit or with a NEMA 1 enclosure if mounted inside the unit, with external signal tubing, power, and output signal connections.
4. The electronic differential pressure transmitter shall be Setra Systems Model 264 or equivalent.

2.09 UNIT TESTING AND QUALITY CONTROL

- A. All fans which have complete motor controls to include overloads and circuit protection shall be factory run tested to insure proper fan RPM and operation. Testing the fans does not require load, static pressure, air velocity or performance testing. Testing the load, static pressure, air velocity or performance testing is optional and must be listed in the submittal. All electrical circuits shall be tested for correct operation and wiring integrity. Units shall pass quality control checks and must be thoroughly cleaned prior to shipment.
- B. Optional cabinet leakage test: Air-handling unit leakage data shall be submitted for review by Owner's representative. The mechanical engineer shall be allowed to witness the leakage test. The air-handling unit manufacturer shall notify the mechanical engineer a minimum of ten (10) days prior to test as to the location and date of the test. The travel costs incurred by test witnesses shall be borne by the Purchaser.
 1. A pressure blower that is capable of producing the required pressure without operating at a stall shall be used to perform the test. The pressurizing fan shall be attached to a flow metering station which shall measure the volume flow rate by pressure drop through calibrated nozzles. The air-handling unit shall have all duct openings, damper, and louver openings sealed.
 2. The cabinet shall be pressurized to 1.5 times operating pressure of the cabinet or 10 in. static pressure. Cabinet leakage shall not exceed a Leakage Class rating of 6 as defined by ANSI/ASHRAE Standard 111 or 1% of the unit design airflow.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

3. The leakage rate will be recorded at the flow measuring apparatus. The air density at which the test was performed will be determined.
4. Manufacturer may be required to test up to ± 15 in. wg with less than 1% air leakage rate.

2.10 START-UP SERVICE

- A. Factory start-up assistance is available at an additional cost to be defined based on the jobsite location and number of units. Purchaser's Contractor is responsible for installation and start-up and the Seller will only provide onsite training and assistance for the contractor.
- B. Extended warranty of components may require installation by factory-certified technicians who are certified by the component manufacturer.

2.11 ENVIRONMENTAL REQUIREMENTS

- A. Contractor: Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings are lubricated, and fan has been test run under observation.
- B. Contractor: Do not store or use any hazardous materials or chemical on or in the unit.

PART 3 - EXECUTION

3.01 GENERAL

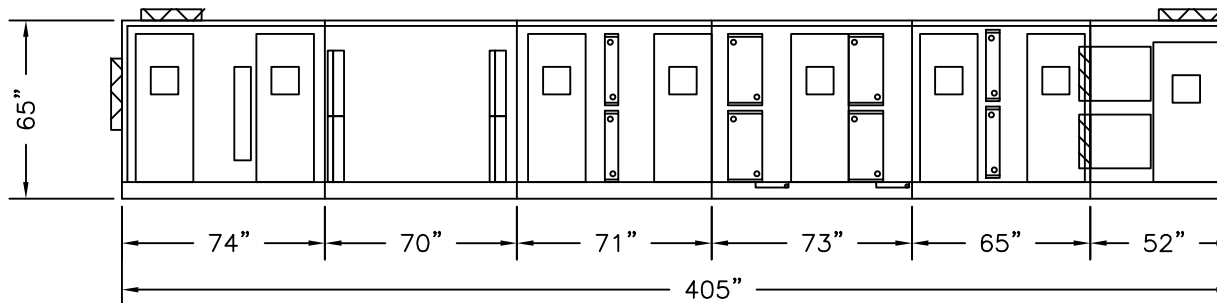
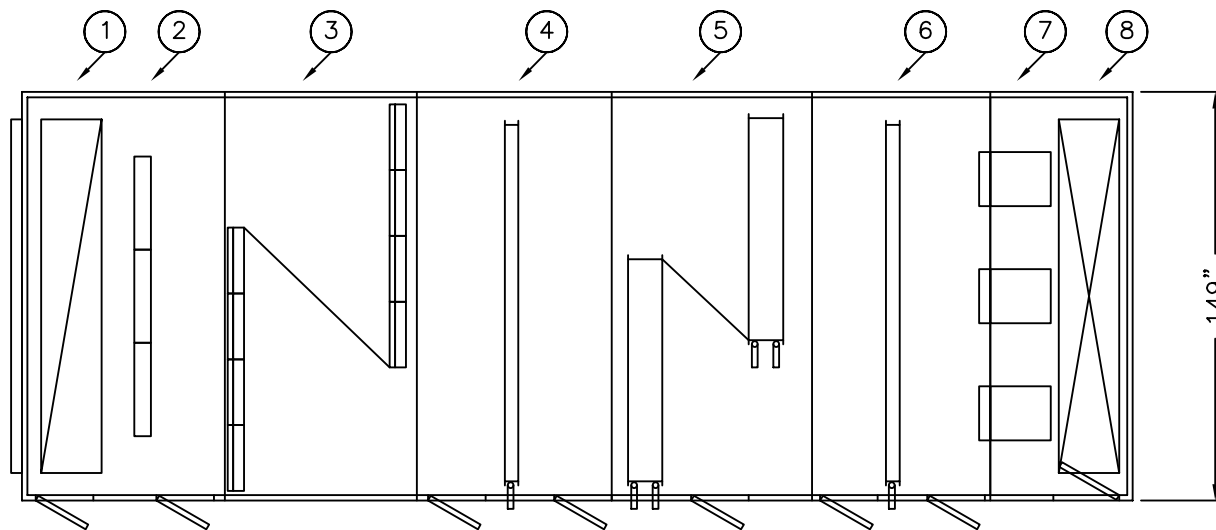
- A. Install with stainless steel drain pan with condensate drain to suitable discharge point.
- B. Provide with unions, strainer, balancing valves, P/T ports and shut-off valves on water connections.
- C. Provide 2 or 3-way control valves as indicate on the plans.
- D. Install with flexible duct connections.
- E. Provide clearance for filter removal.
- F. Install on 6" rail base.
- G. Provide with vibration isolation.
- H. Units will be installed in the mechanical room located in the basement of the library.
 1. Units are to be brought in in modules, through areaways. Refer to attached image for locations.
 2. The areaway for AHU-1 is 150" long x 60" wide
 3. The areaway for AHU-2 is 226" long x 88" wide
 4. The areaway for AHU-3 is 150" long x 60" wide
 5. All areaways are 138" deep. AHU-1 and AHU-3 can be brought in through the largest areaway (AHU-2) if needed.
 6. CMU walls leading to the areaways from the mechanical room can be temporarily removed.
 7. The contractor is encouraged to visit the site and confirm access to the mechanical room.

END OF SECTION

**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

APPROXIMATE UNIT DRY WEIGHT	
TOTAL WEIGHT	19,000 LBS

- 1—Mixing Box
- 2—Air Blender
- 3—Filter Section
2" MV8
- 4—Hot Water Coil
4" MV14
- 5—Cooling Coil Section
- 6—Reheat Coil Section
- 7—Supply Fan Section
- 8—Discharge Section



NOTES:

- 1—2" WALLS, 6" BASE
- 2—INDOOR UNIT
- 3—KNOCKED-DOWN
- 4—ON SITE AREAWAY OPENING 150" W X 60" L (DEPTH?)

Drawing for representational purposes only

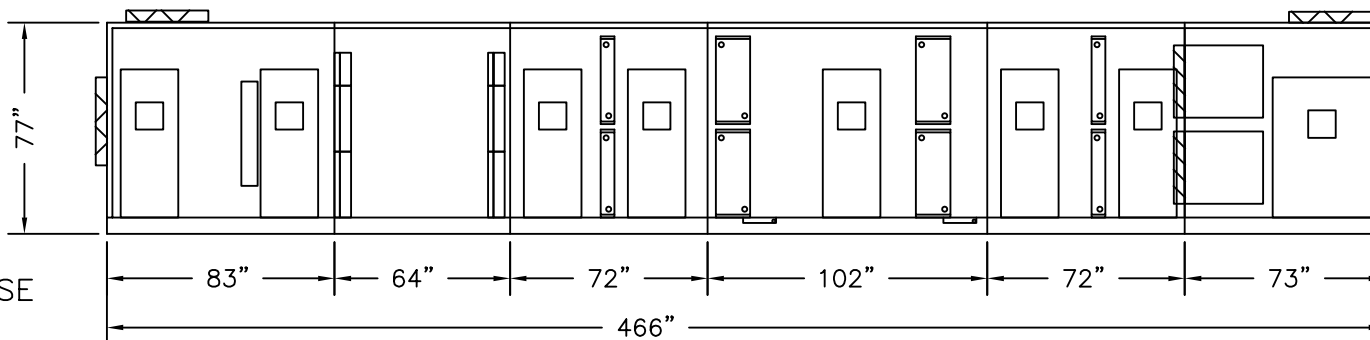
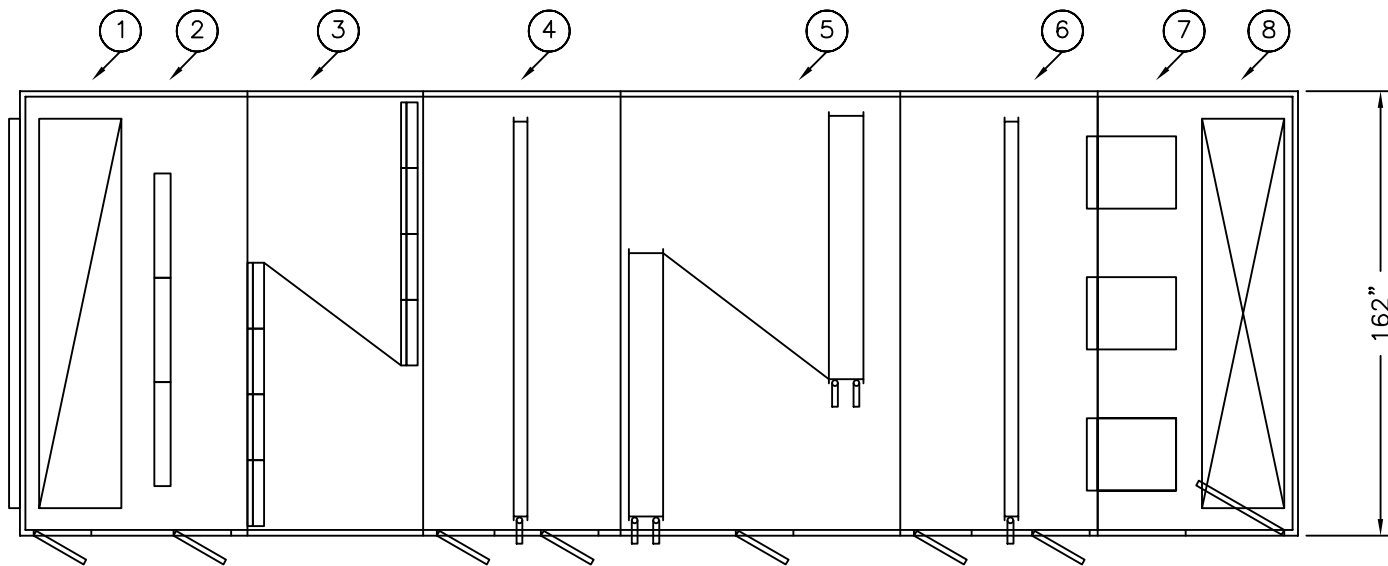
TITLE: AHU-1 (27,000 CFM)	PROJ NO / PROJECT NO: Q39775	05	2024/03/20	KW	-	-
		REV.	DATE	DSS/DWN	VER/CKD	APP/APP
PROJECT: ROWAN UNIVERSITY LIBRARY	ECHELLE / SCALE: NOT TO SCALE					
CUSTOMER:	DESS / DWN: KW	VER / CKD:	APP / APP:			
AGENT: JAKE NOCCILO	DATE: 2022/08/05					
ENGINEER:	DESS NO / DWG NO: Q39775.001	REVISION 05				



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

APPROXIMATE UNIT DRY WEIGHT	
TOTAL WEIGHT	24,500 LBS


- 1-Mixing Box
- 2-Air Blender
- 3-Filter Section
2" MV8
- 4-Hot Water Coil
4" MV14
- 5-Cooling Coil Section
- 6-Reheat Steam Coil
- 7-Supply Fan Section
- 8-Discharge Section



NOTES:

- 1-2" WALLS, 6" BASE
- 2-INDOOR UNIT
- 3-KNOCKED-DOWN
- 4-ON SITE AREAWAY OPENING 200" W X 88" L (DEPTH?)

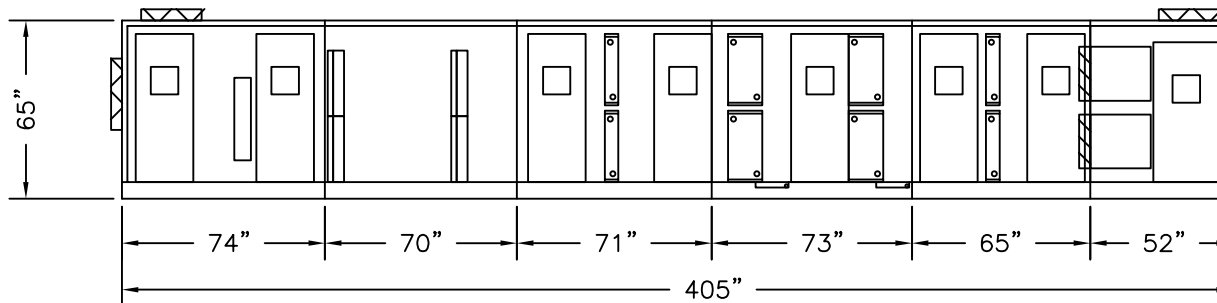
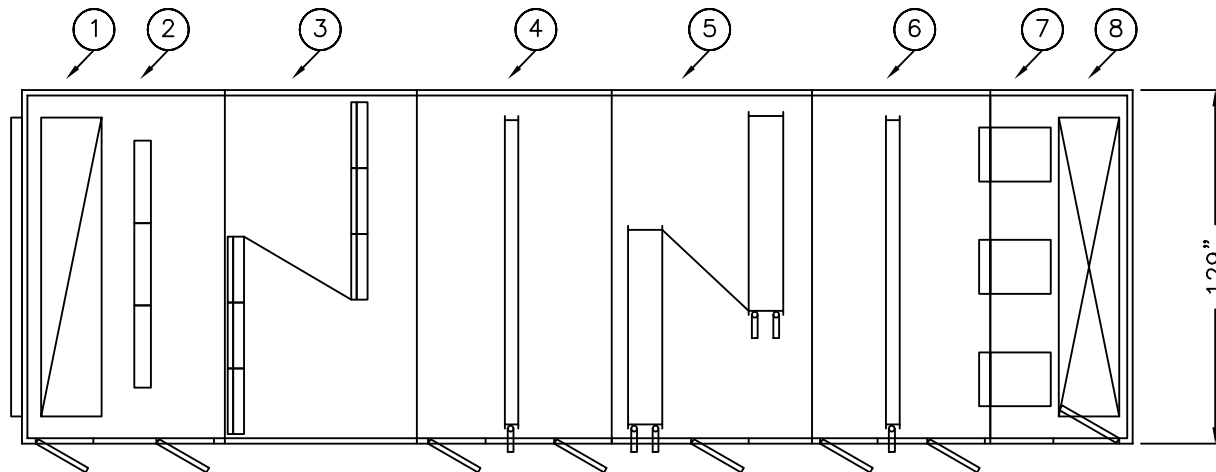
Drawing for representational purposes only

TITLE: AHU-2 (39,700 CFM)	PROJECT NO / PROJECT NO: Q39775	05	2024/03/20	KW	-	-
		REV.	DATE	DSS/DWN	VER/CKD	APP/APP
PROJECT: ROWAN UNIVERSITY LIBRARY	ECHELLE / SCALE: NOT TO SCALE					
CUSTOMER:	DESS / DWN: KW	VER / CKD:	APP / APP:			
AGENT: JAKE NOCCILO	DATE: 2022/08/05					
ENGINEER:	DESS NO / DWG NO: Q39775.002	REVISION 05				

**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

APPROXIMATE UNIT DRY WEIGHT	
TOTAL WEIGHT	17,000 LBS


- 1—Mixing Box
- 2—Air Blender
- 3—Filter Section
2" MV8
- 4—Hot Water Coil
4" MV14
- 5—Cooling Coil Section
- 6—Reheat Coil Section
- 7—Supply Fan Section
- 8—Discharge Section



NOTES:

- 1—2" WALLS, 6" BASE
- 2—INDOOR UNIT
- 3—KNOCKED-DOWN
- 4—ON SITE AREAWAY OPENING 150" W X 60" L (DEPTH?)

Drawing for representational purposes only

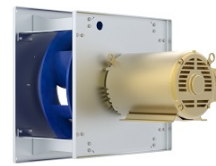
TITLE: AHU-3 (23,500 CFM)	PROJ NO / PROJECT NO: Q39775			05	2024/03/20	KW	-	-		
	ECHELLE / SCALE: NOT TO SCALE			REV.	DATE	DSS/DWN	VER/CKD	APP/APP		
PROJECT: ROWAN UNIVERSITY LIBRARY	DESS / DWN: KW			VER / CKD:		APP / APP:				
CUSTOMER:	DATE: 2022/08/05									
AGENT: JAKE NOCCILO	DESS NO / DWG NO: Q39775.003								REVISION 05	
ENGINEER:										

FANselect

fan data

3/20/2024

version FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

AHU-1 SF
QTY: 4

type	GR50C-4DM.H2.CR*
article no.	115205/HA03 Portfolio AMCA USA
arrangement	Multiple Fans arrangement 4 [1 1 1 1]

technical data

motor	ZAmotpremium PE
Efficiency class	PEM
power output ($P_{2\text{ main}}$)	hp 10
mains supply	- 3~ 460V 60Hz Y
nominal current (I_N)	A 12.50
motor efficiency grade (η_M)	% 91.7
ambient temperature, max. limit (t_r)	°C 40
grille influence	no

fan data

SFP-class SFP-value (P_{SFP})	- Ws/m ³	5 2078
FEG	%	85
FEI	-	1.3
airflow volume (q_v)	ft ³ /min	27000.0
air velocity	ft/s	43.15
pressure, stat. (p_{SF}) tot. (p_F)	in.wg.	5.450 5.862
electrical power input (P_{sys})	hp	35.51
system eff., stat. ($\eta_{\text{SF,sys}}$) tot. ($\eta_{\text{F,sys}}$)	%	65.3 70.3
electrical power input (P_1)	hp	34.44
efficiency grade, stat. (η_{SF}) tot. (η_F)	%	67.4 72.5
shaft power (P_L) max. ($P_{L\text{ max}}$)	hp	31.71 31.80
impeller eff., stat. ($\eta_{\text{SF,L}}$) tot. ($\eta_{\text{F,L}}$)	%	73.2 78.7
fan speed (n) max. (n_{max})	rpm	2327 2450
fan speed, set value (% n_{max})	%	95
frequency (f_{DP}) (f_{max})	Hz	79 83
voltage (U_{DP})	V	460
acoustics, suction side ($L_{\text{w(A),5}}$) ($L_{\text{w,5}}$)	dB	89 92
acoustics, pressure side ($L_{\text{w(A),6}}$) ($L_{\text{w,6}}$)	dB	98 101
dimensions (w x h x d)	in	26.38 x 26.38 x 28.58
product weight (m_{pr})	lb	229.3
k-factor nozzle pres. (k)	-	252
differential pres. nozzle ($p_{\text{SF nozzle}}$)	Pa	2071
installation space dimensions (W x H x D)	in	145.00 x 57.00 x 40.00
housing/impeller	-	1.8

4 x (nominal values for one fan)
 3~ 208-230V D 60Hz P2 10HP
 26.00A 1770/MIN 40°C
 3~ 460V Y 60Hz P2 10HP
 12.50A 1770/MIN 40°C
 OPSB THCL155
 fan speed, max. (n_{max}) 2450 1/min

nominal values

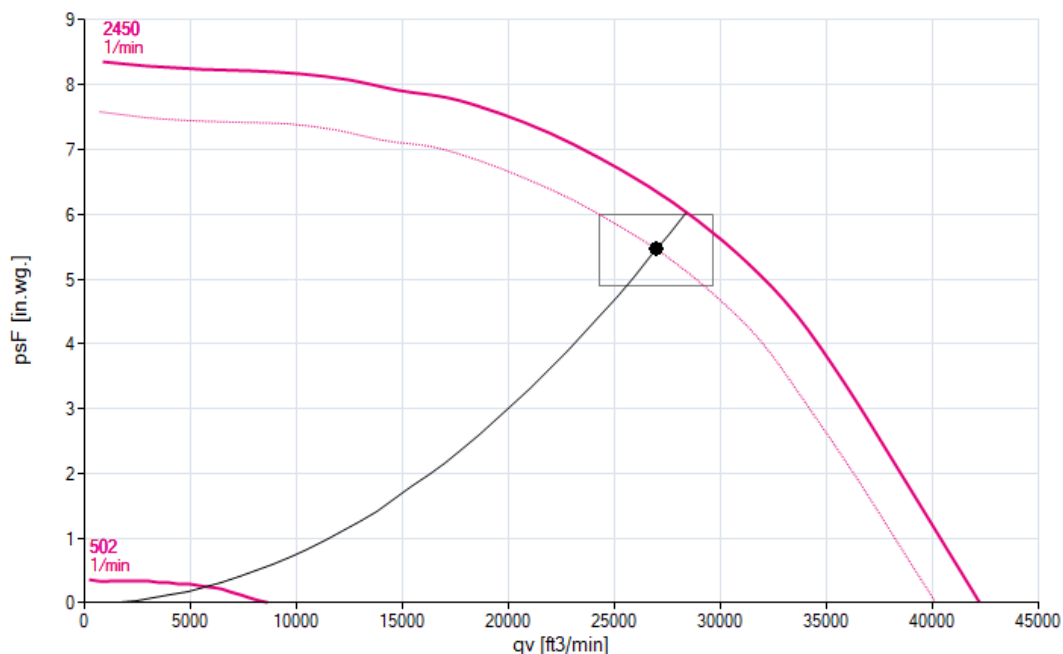
PF:PF_53; BR:BR_17; Mult.Fan.var; qv:27000.0 ft³/min; p_s:5.450 in.wg.; mains:3~ / 460V / 60 Hz; t:68 °F; p:0.072 lbs/ft³;
 STol:+-10 %; BF:; BxHxD:145.0inx57.0inx40.0in



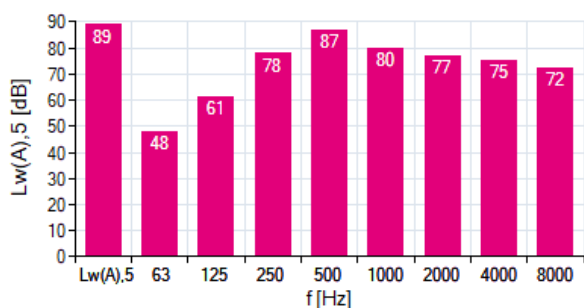
performance curve / acoustics 3/20/2024
Version: FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

- 1 **GR50C-4DM.H2.CR*** measured in standard nozzle in installation type A according to ISO 5801 with calculated installation losses
 115205/HA03 | Portfolio measurement density 0.072 [lbs/ft³]
 AMCA USA | Multiple Fan 4
 [1|1|1|1]

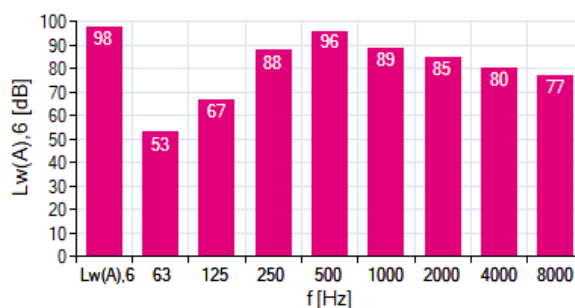
air performance p_{sF}



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR50C-4DM.H2.CR*																			
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000	f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	89	48	61	78	87	80	77	75	72	$L_{w(A),6}$	98	53	67	88	96	89	85	80	77
$L_{w,5}$	92	74	77	86	90	80	76	74	73	$L_{w,6}$	101	78	83	96	99	89	84	79	78

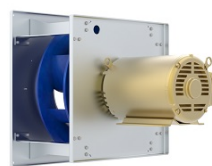
FANselect

fan data

3/20/2024

version FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

AHU-1 SF
QTY: 4
MAX SP



type	GR50C-4DM.H2.CR*
article no.	115205/HA03 Portfolio AMCA USA
arrangement	Multiple Fans arrangement 4 [1 1 1 1]

technical data

motor	ZAmotpremium PE
Efficiency class	PEM
power output ($P_{2\text{ main}}$)	hp 10
mains supply	- 3~ 460V 60Hz Y
nominal current (I_N)	A 12.50
motor efficiency grade (η_M)	% 91.7
ambient temperature, max. limit (t_r)	°C 40
grille influence	no

fan data

SFP-class SFP-value (P_{SFP})	- Ws/m ³	5 2393
FEG	%	85
FEI	-	1.29
airflow volume (q_v)	ft ³ /min	27000.0
air velocity	ft/s	43.15
pressure, stat. (p_{sF}) tot. (p_F)	in.wg.	6.300 6.712
electrical power input (P_{sys})	hp	40.89
system eff., stat. ($\eta_{sF,sys}$) tot. ($\eta_{F,sys}$)	%	65.6 69.9
electrical power input (P_1)	hp	39.67
efficiency grade, stat. (η_{sF}) tot. (η_F)	%	67.6 72.0
shaft power (P_L) max. ($P_{L\text{ max}}$)	hp	36.72 36.73
impeller eff., stat. ($\eta_{sF,L}$) tot. ($\eta_{F,L}$)	%	73.0 77.8
fan speed (n) max. (n_{max})	rpm	2441 2450
fan speed, set value (% n_{max})	%	100
frequency (f_{DP}) (f_{max})	Hz	83 83
voltage (U_{DP})	V	460
acoustics, suction side ($L_{w(A),5}$) ($L_{w,5}$)	dB	91 94
acoustics, pressure side ($L_{w(A),6}$) ($L_{w,6}$)	dB	100 103
dimensions (w x h x d)	in	26.38 x 26.38 x 28.58
product weight (m_{pr})	lb	229.3
k-factor nozzle pres. (k)	-	252
differential pres. nozzle ($p_{sF\text{ nozzle}}$)	Pa	2071
installation space dimensions (W x H x D)	in	145.00 x 57.00 x 40.00
housing/impeller	-	1.8

nominal values

4 x (nominal values for one fan)
 3~ 208-230V D 60Hz P2 10HP
 26.00A 1770/MIN 40°C
 3~ 460V Y 60Hz P2 10HP
 12.50A 1770/MIN 40°C
 OPSB THCL155
 fan speed, max. (n_{max}) 2450 1/min

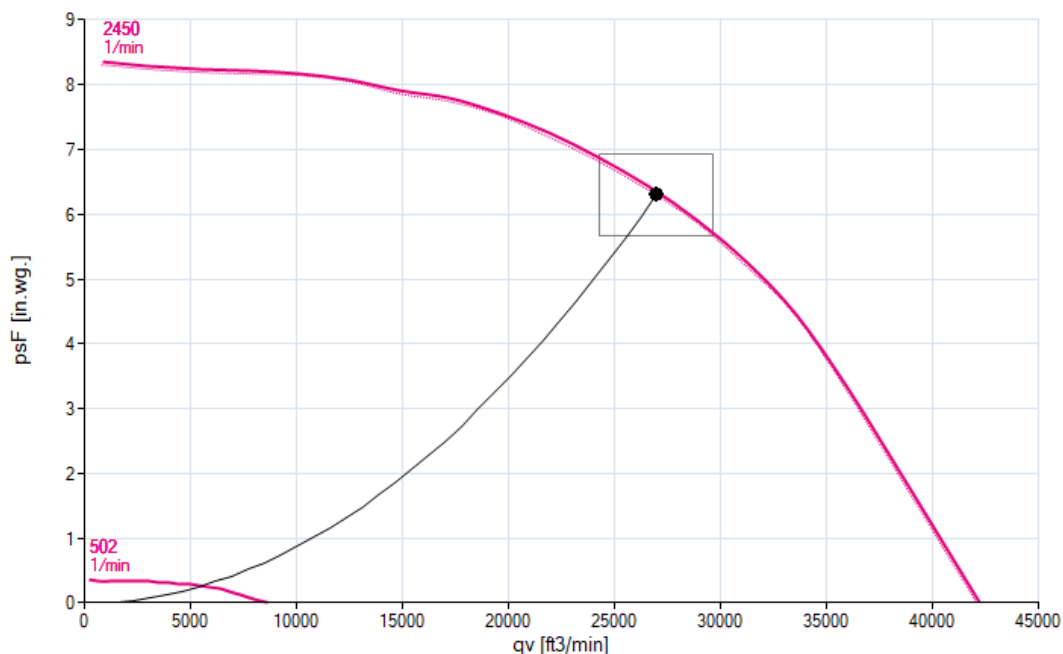
PF:PF_53; BR:BR_17; Mult.Fan.var; qv:27000.0 ft³/min; p_s:6.300 in.wg.; mains:3~ / 460V / 60 Hz; t:68 °F; p:0.072 lbs/ft³;
 STol:+-10 %; BF:; BxHxD:145.0inx57.0inx40.0in



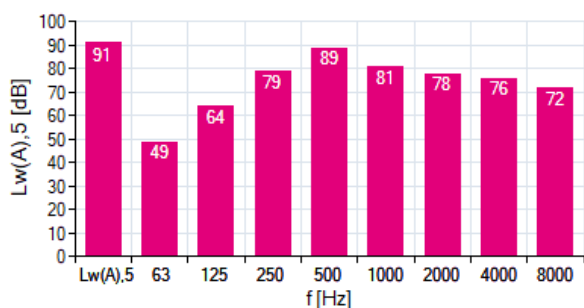
performance curve / acoustics 3/20/2024
Version: FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
 RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

- 1 **GR50C-4DM.H2.CR*** measured in standard nozzle in installation type A according to ISO 5801 with calculated installation losses
 115205/HA03 | Portfolio measurement density 0.072 [lbs/ft³]
 AMCA USA | Multiple Fan 4
 [1|1|1|1|1]

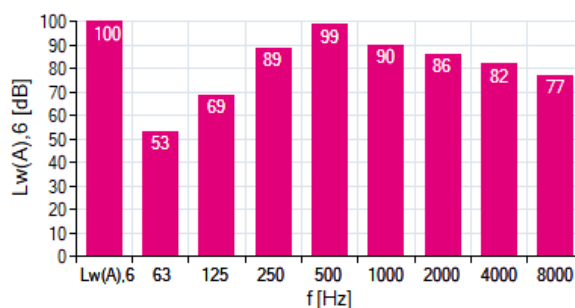
air performance p_{sF}



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR50C-4DM.H2.CR*									
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	91	49	64	79	89	81	78	76	72
$L_{w,5}$	94	75	79	88	92	81	77	75	73

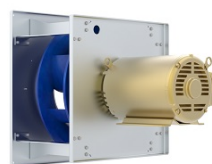
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),6}$	100	53	69	89	99	90	86	82	77
$L_{w,6}$	103	79	84	97	102	90	85	81	78

FANselect

fan data

3/20/2024

version FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

AHU-2 SF
QTY: 6

type	GR50C-4DM.H2.CR*
article no.	115205/HA03 Portfolio AMCA USA
arrangement	Multiple Fans arrangement 6 [2 2 2]

technical data

motor	ZAmotpremium PE
Efficiency class	PEM
power output ($P_{2\text{ main}}$)	hp 10
mains supply	- 3~ 460V 60Hz Y
nominal current (I_N)	A 12.50
motor efficiency grade (η_M)	% 91.7
ambient temperature, max. limit (t_r)	°C 40
grille influence	no

fan data

SFP-class SFP-value (P_{SFP})	- Ws/m ³	5 2104
FEG	%	85
FEI	-	1.29
airflow volume (q_v)	ft ³ /min	39700.0
air velocity	ft/s	42.30
pressure, stat. (p_{SF}) tot. (p_F)	in.wg.	5.500 5.896
electrical power input (P_{sys})	hp	52.87
system eff., stat. ($\eta_{\text{SF,sys}}$) tot. ($\eta_{\text{F,sys}}$)	%	65.1 69.8
electrical power input (P_1)	hp	51.29
efficiency grade, stat. (η_{SF}) tot. (η_F)	%	67.1 71.9
shaft power (P_L) max. ($P_{L\text{ max}}$)	hp	47.20 47.28
impeller eff., stat. ($\eta_{\text{SF,L}}$) tot. ($\eta_{\text{F,L}}$)	%	72.9 78.2
fan speed (n) max. (n_{max})	rpm	2320 2450
fan speed, set value (% n_{max})	%	95
frequency (f_{DP}) (f_{max})	Hz	79 83
voltage (U_{DP})	V	460
acoustics, suction side ($L_{\text{w(A),5}}$) ($L_{\text{w},5}$)	dB	88 92
acoustics, pressure side ($L_{\text{w(A),6}}$) ($L_{\text{w},6}$)	dB	98 101
dimensions (w x h x d)	in	26.38 x 26.38 x 28.58
product weight (m_{pr})	lb	229.3
k-factor nozzle pres. (k)	-	252
differential pres. nozzle ($p_{\text{SF nozzle}}$)	Pa	1990
installation space dimensions (W x H x D)	in	158.00 x 69.00 x 40.00
housing/impeller	-	1.7

6 x (nominal values for one fan)
 3~ 208-230V D 60Hz P2 10HP
 26.00A 1770/MIN 40°C
 3~ 460V Y 60Hz P2 10HP
 12.50A 1770/MIN 40°C
 OPSB THCL155
 fan speed, max. (n_{max}) 2450 1/min

nominal values

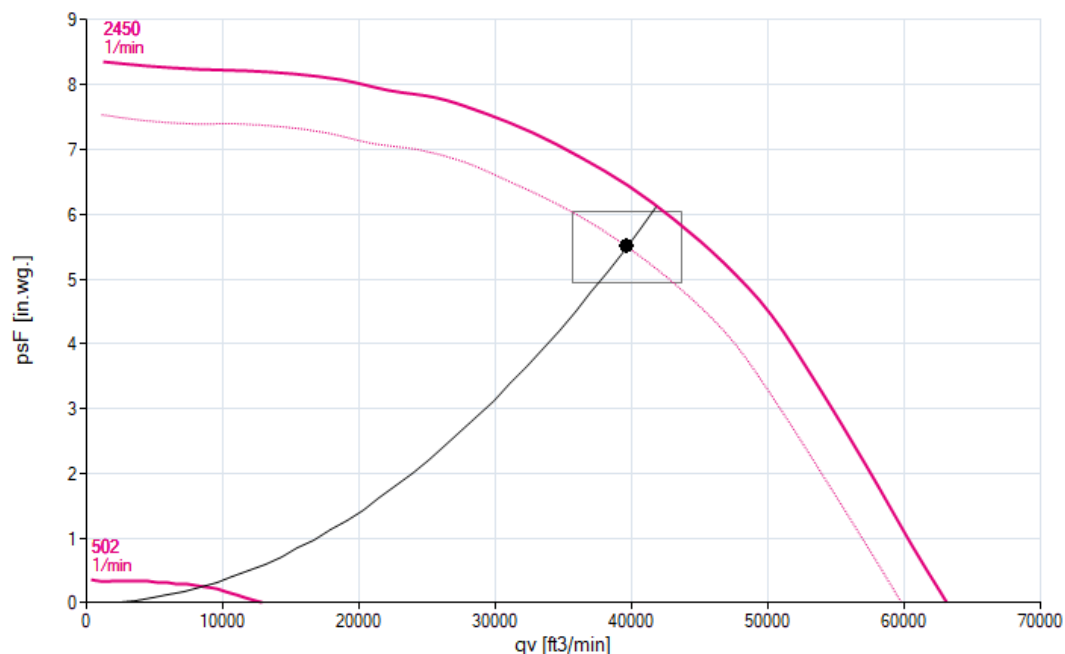
PF:PF_53; BR:BR_17; MultFan:6; q_v :39700.0 ft³/min; p_{SF} :5.500 in.wg.; mains:3~ / 460V / 60 Hz; t_r :68 °F; p :0.072 lbs/ft³; STol:+-10 %; BF;; BxHxT:158.0inx69.0inx40.0in



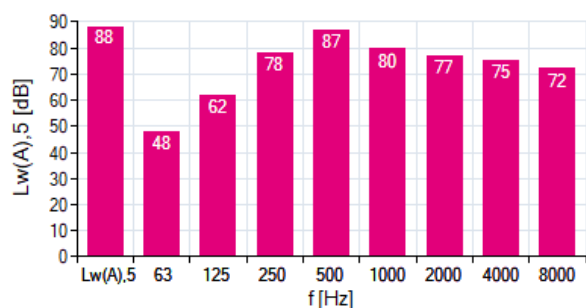
performance curve / acoustics 3/20/2024
Version: FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

- 1 **GR50C-4DM.H2.CR*** measured in standard nozzle in installation type A according to ISO 5801 with calculated installation losses
 115205/HA03 | Portfolio measurement density 0.072 [lbs/ft³]
 AMCA USA | Multiple Fan 6
 [2|2|2]

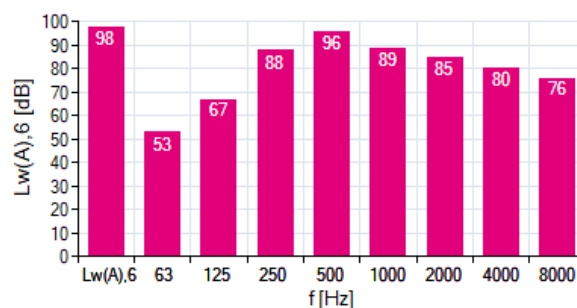
air performance p_{sF}



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR50C-4DM.H2.CR*									
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	88	48	62	78	87	80	77	75	72
$L_{w,5}$	92	74	77	86	90	80	76	74	73
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),6}$	98	53	67	88	96	89	85	80	76
$L_{w,6}$	101	78	83	96	99	89	84	79	77

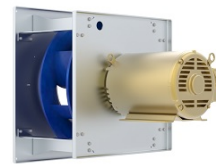
FANselect

fan data

3/20/2024

version FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

AHU-2 SF
QTY: 6
MAX SP



type	GR50C-4DM.H2.CR*
article no.	115205/HA03 Portfolio AMCA USA
arrangement	Multiple Fans arrangement 6 [2 2 2]

technical data

motor	ZAmotpremium PE
Efficiency class	PEM
power output ($P_{2\text{ main}}$)	hp 10
mains supply	- 3~ 460V 60Hz Y
nominal current (I_N)	A 12.50
motor efficiency grade (η_M)	% 91.7
ambient temperature, max. limit (t_r)	°C 40
grille influence	no

fan data

SFP-class SFP-value (P_{SFP})	- Ws/m ³	5 2405
FEG	%	85
FEI	-	1.28
airflow volume (q_v)	ft ³ /min	39700.0
air velocity	ft/s	42.30
pressure, stat. (p_{sF}) tot. (p_F)	in.wg.	6.300 6.696
electrical power input (P_{sys})	hp	60.43
system eff., stat. ($\eta_{sF,sys}$) tot. ($\eta_{F,sys}$)	%	65.2 69.4
electrical power input (P_1)	hp	58.61
efficiency grade, stat. (η_{sF}) tot. (η_F)	%	67.3 71.5
shaft power (P_L) max. ($P_{L\text{ max}}$)	hp	54.23 54.25
impeller eff., stat. ($\eta_{sF,L}$) tot. ($\eta_{F,L}$)	%	72.7 77.3
fan speed (n) max. (n_{max})	rpm	2429 2450
fan speed, set value ($\%n_{max}$)	%	99
frequency (f_{DP}) (f_{max})	Hz	82 83
voltage (U_{DP})	V	460
acoustics, suction side ($L_{w(A),5}$) ($L_{w,5}$)	dB	91 94
acoustics, pressure side ($L_{w(A),6}$) ($L_{w,6}$)	dB	100 103
dimensions (w x h x d)	in	26.38 x 26.38 x 28.58
product weight (m_{pr})	lb	229.3
k-factor nozzle pres. (k)	-	252
differential pres. nozzle ($p_{sF\text{ nozzle}}$)	Pa	1990
installation space dimensions (W x H x D)	in	158.00 x 69.00 x 40.00
housing/impeller	-	1.7

nominal values

6 x (nominal values for one fan)
3~ 208-230V D 60Hz P2 10HP
26.00A 1770/MIN 40°C
3~ 460V Y 60Hz P2 10HP
12.50A 1770/MIN 40°C
OPSB THCL155
fan speed, max. (n_{max}) 2450 1/min

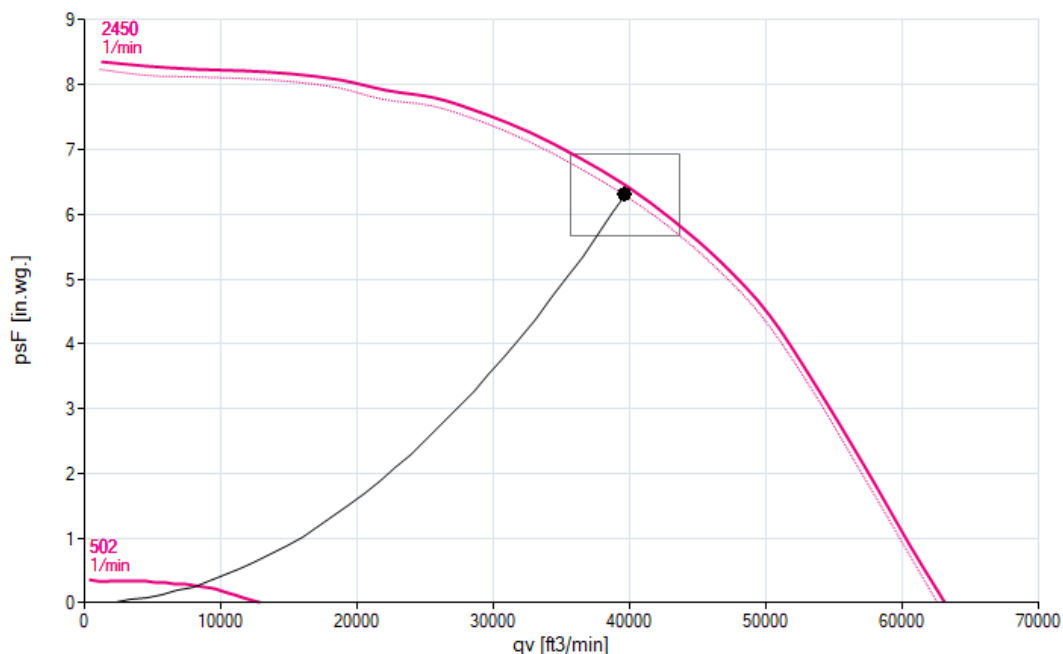
PF:PF_53; BR:BR_17; MultFan:6; q_v :39700.0 ft³/min; p_{sF} :6.300 in.wg.; mains:3~ / 460V / 60 Hz; t_r :68 °F; p :0.072 lbs/ft³; STol:+-10 %; BF;; BxHxT:158.0inx69.0inx40.0in



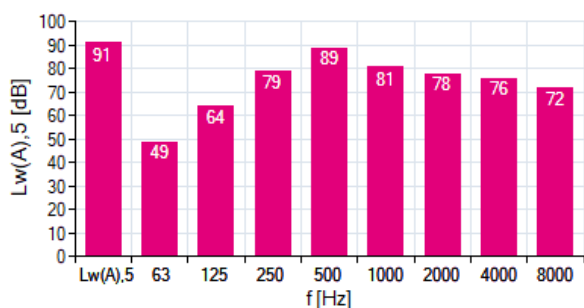
performance curve / acoustics 3/20/2024
Version: FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
 RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

- 1 **GR50C-4DM.H2.CR*** measured in standard nozzle in installation type A according to ISO 5801 with calculated installation losses
 115205/HA03 | Portfolio measurement density 0.072 [lbs/ft³]
 AMCA USA | Multiple Fan 6
 [2|2|2]

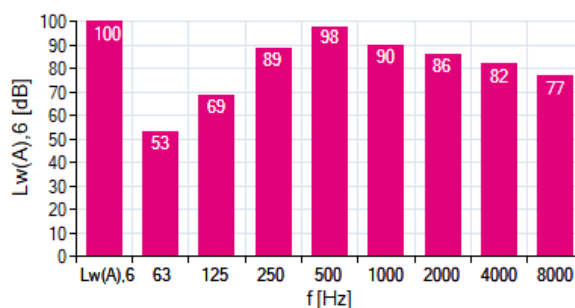
air performance p_{sF}



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR50C-4DM.H2.CR*									
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	91	49	64	79	89	81	78	76	72
$L_{w,5}$	94	75	80	88	92	81	77	75	73

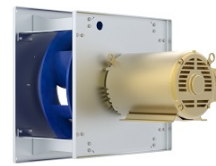
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),6}$	100	53	69	89	98	90	86	82	77
$L_{w,6}$	103	78	84	97	101	90	85	81	78

FANselect

fan data

3/20/2024

version FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

AHU-3 SF
QTY: 6

type	GR35C-2DM.F2.CR*
article no.	115196/HA03 Portfolio AMCA USA
arrangement	Multiple Fans arrangement 6 [2 2 2]

technical data

motor	ZAmotpremium PE
Efficiency class	PEM
power output ($P_{2\text{ main}}$)	hp 7.5
mains supply	- 3~ 460V 60Hz Y
nominal current (I_N)	A 8.60
motor efficiency grade (η_M)	% 88.5
ambient temperature, max. limit (t_r)	°C 40
grille influence	no

fan data

SFP-class SFP-value (P_{SFP})	- Ws/m ³	5 2284
FEG	%	90
FEI	-	1.21
airflow volume (q_v)	ft ³ /min	23500.0
air velocity	ft/s	50.59
pressure, stat. (p_{sF}) tot. (p_F)	in.wg.	5.550 6.113
electrical power input (P_{sys})	hp	33.97
system eff., stat. ($\eta_{sF,sys}$) tot. ($\eta_{F,sys}$)	%	60.5 66.7
electrical power input (P_1)	hp	32.96
efficiency grade, stat. (η_{sF}) tot. (η_F)	%	62.4 68.7
shaft power (P_L) max. ($P_{L\text{ max}}$)	hp	29.32 30.07
impeller eff., stat. ($\eta_{sF,L}$) tot. ($\eta_{F,L}$)	%	70.1 77.2
fan speed (n) max. (n_{max})	rpm	3589 3740
fan speed, set value ($\%n_{max}$)	%	96
frequency (f_{DP}) (f_{max})	Hz	62 65
voltage (U_{DP})	V	460
acoustics, suction side ($L_{w(A),5}$) ($L_{w,5}$)	dB	87 91
acoustics, pressure side ($L_{w(A),6}$) ($L_{w,6}$)	dB	96 99
dimensions (w x h x d)	in	19.69 x 19.69 x 22.13
product weight (m_{pr})	lb	116.8
k-factor nozzle pres. (k)	-	121
differential pres. nozzle ($p_{sF\text{ nozzle}}$)	Pa	3025
installation space dimensions (W x H x D)	in	125.00 x 57.00 x 40.00
housing/impeller	-	2

nominal values

6 x (nominal values for one fan)
 3~ 208-230V D 60Hz P2 7.5HP
 18.00A 3450/MIN 40°C
 3~ 460V Y 60Hz P2 7.5HP
 8.60A 3450/MIN 40°C
 OPSB THCL155
 fan speed, max. (n_{max}) 3740 1/min

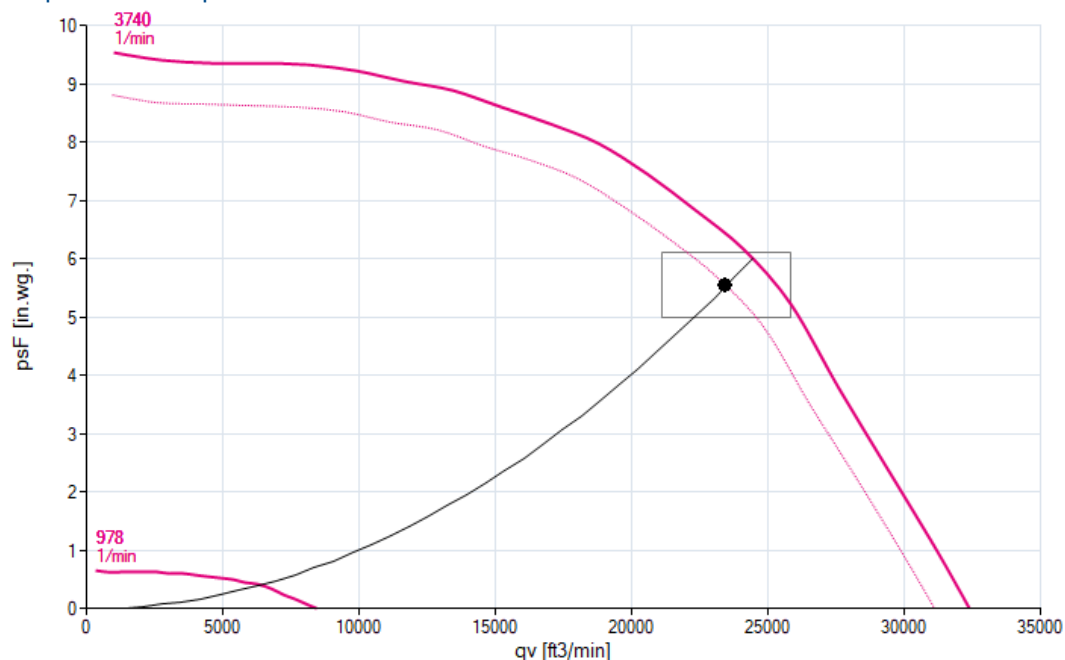
PF:PF_53; BR:BR_17; MultFan:6; q_v :23500.0 ft³/min; p_{sF} :5.550 in.wg.; mains:3~ / 460V / 60 Hz; t_r :68 °F; p :0.072 lbs/ft³;
 STol:+-10 %; BF;; BxHxT:125.0inx57.0inx40.0in



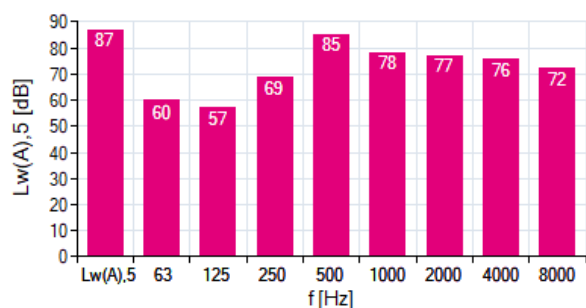
performance curve / acoustics 3/20/2024
Version: FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

1 GR35C-2DM.F2.CR* measured in standard nozzle in installation type A according to ISO 5801 with calculated installation losses
 115196/HA03 | Portfolio measurement density 0.072 [lbs/ft³]
 AMCA USA | Multiple Fan 6
 [2|2|2]

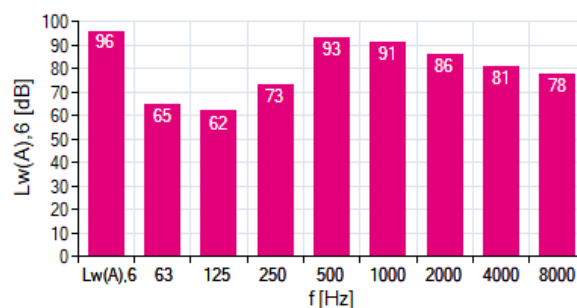
air performance ps_F



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR35C-2DM.F2.CR*									
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	87	60	57	69	85	78	77	76	72
$L_{w,5}$	91	85	72	78	88	78	76	75	73
f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),6}$	96	65	62	73	93	91	86	81	78
$L_{w,6}$	99	90	77	82	96	91	85	80	79

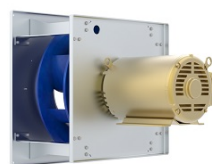
FANselect

fan data

3/20/2024

version FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

AHU-3 SF
QTY: 6
MAX SP



type	GR35C-2DM.F2.CR*
article no.	115196/HA03 Portfolio AMCA USA
arrangement	Multiple Fans arrangement 6 [2 2 2]

technical data

motor	ZAmotpremium PE
Efficiency class	PEM
power output ($P_{2\text{ main}}$)	hp 7.5
mains supply	- 3~ 460V 60Hz Y
nominal current (I_N)	A 8.60
motor efficiency grade (η_M)	% 88.5
ambient temperature, max. limit (t_r)	°C 40
grille influence	no

fan data

SFP-class SFP-value (P_{SFP})	- Ws/m ³	5 2558
FEG	%	90
FEI	-	1.21
airflow volume (q_v)	ft ³ /min	23500.0
air velocity	ft/s	50.59
pressure, stat. (p_{sF}) tot. (p_F)	in.wg.	6.300 6.863
electrical power input (P_{sys})	hp	38.04
system eff., stat. ($\eta_{sF,sys}$) tot. ($\eta_{F,sys}$)	%	61.4 66.8
electrical power input (P_1)	hp	36.90
efficiency grade, stat. (η_{sF}) tot. (η_F)	%	63.2 68.9
shaft power (P_L) max. ($P_{L\text{ max}}$)	hp	32.96 33.41
impeller eff., stat. ($\eta_{sF,L}$) tot. ($\eta_{F,L}$)	%	70.8 77.1
fan speed (n) max. (n_{max})	rpm	3717 3740
fan speed, set value (% n_{max})	%	99
frequency (f_{DP}) (f_{max})	Hz	65 65
voltage (U_{DP})	V	460
acoustics, suction side ($L_{w(A),5}$) ($L_{w,5}$)	dB	88 91
acoustics, pressure side ($L_{w(A),6}$) ($L_{w,6}$)	dB	97 99
dimensions (w x h x d)	in	19.69 x 19.69 x 22.13
product weight (m_{pr})	lb	116.8
k-factor nozzle pres. (k)	-	121
differential pres. nozzle ($p_{sF\text{ nozzle}}$)	Pa	3025
installation space dimensions (W x H x D)	in	125.00 x 57.00 x 40.00
housing/impeller	-	2

6 x (nominal values for one fan)
3~ 208-230V D 60Hz P2 7.5HP
18.00A 3450/MIN 40°C
3~ 460V Y 60Hz P2 7.5HP
8.60A 3450/MIN 40°C
OPSB THCL155
fan speed, max. (n_{max}) 3740 1/min

nominal values

PF:PF_53; BR:BR_17; MultFan:6; q_v :23500.0 ft³/min; p_{sF} :6.300 in.wg.; mains:3~ / 460V / 60 Hz; t_r :68 °F; p :0.072 lbs/ft³; STol:+-10 %; BF:; BxHxT:125.0inx57.0inx40.0in



FANselect

performance curve / acoustics

3/20/2024

Version: FANselect V 1.01 (230403), AMCA V 1.03 September, 2021
 RLT V 1.00 Dezember, 2021 / 1.23.04.03 | 33275 | (user ZAFS23275)

GR35C-2DM.F2.CR*

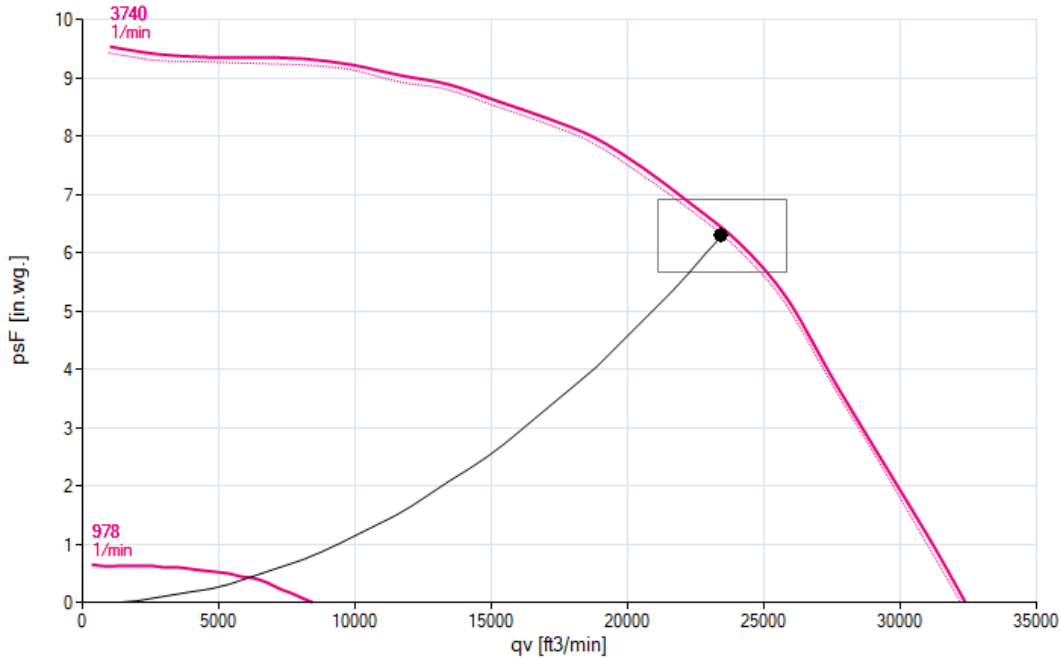
measured in standard nozzle in installation type A according to ISO 5801 with calculated installation losses

1

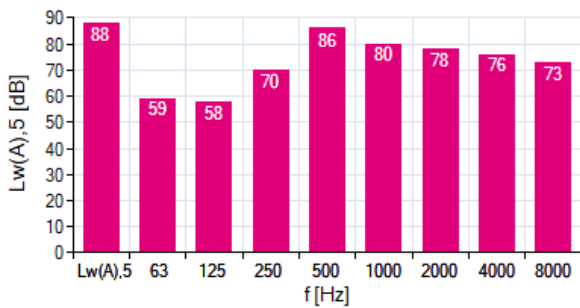
115196/HA03 | Portfolio
AMCA USA | Multiple Fan 6
[2][2][2]

measurement density 0.072 [lbs/ft³]

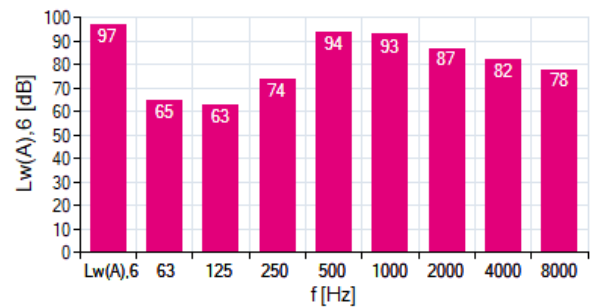
air performance ps_F



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR35C-2DM.F2.CR*

f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	88	59	58	70	86	80	78	76	73
$L_{w,5}$	91	85	73	78	89	80	77	75	74

f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),6}$	97	65	63	74	94	93	87	82	78
$L_{w,6}$	99	90	79	82	97	93	86	81	79



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-1 CC

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
W-9.0AS-24.0 X 81.0-6-1	4	81.00	1,318

Coil Type: W **Totals:** 4 1,318

Coil Hand: Unspecified **Tube:** 0.625 inch X 0.020 inch Copper Seamless Tubes

TF: 16 **Fin Material:** Aluminum Star **Thickness:** 0.0075 IN.

Row: 6 **Csg Material:** 1" Leg with 304 Stainless Casings

Fin: 9 / IN **Connection:** 2" Threaded, Carbon Stl, Extended 5 inches

Circuit: Full **Hdr Material:** Standard Carbon Stl, Brazed Joints

Misc: - Pneumatic Test

Dwg: CA-W-100-25

Performance V

Pressure: 29.92 IN HG Elevation: Sea Level

Airflow:	27,000.0	SCFM	Water		
System Face Area:	54.0	FT ²	Flow Rate:	223.00	GPM
Standard Face Velocity:	500.0	FPM	Entering Temp:	44.0	°F
Entering Dry Bulb Temp:	79.6	°F	Leaving Temp:	54.0	°F
Entering Wet Bulb Temp:	67.7	°F	Tube Velocity:	3.7	FPS
Leaving Dry Bulb Temp:	55.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU
Leaving Wet Bulb Temp:	54.4	°F			
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU			
Sensible Heat Load:	717.5	MBH			
Total Heat Load:	1,113.2	MBH			

Losses

Air Pressure Drop: 0.56 IN H2O Fluid Pressure Drop: 9.8 FT H2O

Comments:

Notes & Warnings:

56 Rated in accordance with AHRI Standard 410.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-1 HW

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-6.0AS-24.0 X 130.0-2-1	2	130.00	401

Coil Type: HW	Totals: 2	401
Coil Hand: Unspecified	Tube: 0.625 inch X 0.020 inch Copper Seamless Tubes, Orificed Tubes	
TF: 16	Fin Material: Aluminum Star	Thickness: 0.0075 IN.
Row: 2	Csg Material: 1" Leg with 304 Stainless Casings	
Fin: 6 / IN	Connection: 2" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Full	Hdr Material: Schedule 40 Carbon Stl Header, Brazed Joints	

Misc: - Pneumatic Test

Dwg: CA-HW-100-15

Performance V

Pressure: 29.92 IN HG Elevation: Sea Level

Airflow:		Water	
Airflow:	27,000.0 SCFM	Flow Rate:	142.00 GPM
System Face Area:	43.3 FT ²	Entering Temp:	180.0 °F
Standard Face Velocity:	623.1 FPM	Leaving Temp:	160.0 °F
Entering Dry Bulb Temp:	11.0 °F	Tube Velocity:	4.7 FPS
Leaving Dry Bulb Temp:	58.0 °F	Inside Surface Fouling:	0.0000 HR·FT ² ·°F/BTU
Outside Surface Fouling:	0.0000 HR·FT ² ·°F/BTU		
Sensible Heat Load:	1,368.9 MBH		
Total Heat Load:	1,368.9 MBH		

Losses

Air Pressure Drop: 0.14 IN H2O Fluid Pressure Drop: 12.1 FT H2O

Comments:

Notes & Warnings:

56 Rated in accordance with AHRI Standard 410.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-1 HW (Morning Warm)

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-6.0AS-24.0 X 130.0-2-1	2	130.00	401

Coil Type: HW	Totals:	2	401
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes, Orificed Tubes	
TF: 16	Fin Material:	Aluminum Star	Thickness: 0.0075 IN.
Row: 2	Csg Material:	1" Leg with 304 Stainless Casings	
Fin: 6 / IN	Connection:	2" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Full	Hdr Material:	Schedule 40 Carbon Stl Header, Brazed Joints	
Misc:		- Pneumatic Test	
			Dwg: CA-HW-100-15

Performance V

Pressure:	29.92	IN HG	Elevation:	Sea Level		
Airflow:	27,000.0	SCFM	Water			
System Face Area:	43.3	FT ²	Flow Rate:	91.00	GPM	
Standard Face Velocity:	623.1	FPM	Entering Temp:	180.0	°F	
Entering Dry Bulb Temp:	60.0	°F	Leaving Temp:	160.0	°F	
			Tube Velocity:	3.0	FPS	
Leaving Dry Bulb Temp:	90.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU	
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU				
Sensible Heat Load:	875.3	MBH				
Total Heat Load:	875.3	MBH				

Losses

Air Pressure Drop:	0.15	IN H2O	Fluid Pressure Drop:	5.3	FT H2O
--------------------	------	--------	----------------------	-----	--------

Comments:

Notes & Warnings:

- 56 Rated in accordance with AHRI Standard 410.
- 46 Total surface not used. Check rows calculated. Reduce fluid flow, rows, or fins per inch.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-1 REHEAT HW

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-5.0AS-24.0 X 130.0-1-0.5	2	130.00	273

Coil Type: HW	Totals:	2	273
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes, Orificed Tubes	
TF: 16	Fin Material:	Aluminum Star	Thickness: 0.0075 IN.
Row: 1	Csg Material:	1" Leg with 304 Stainless Casings	
Fin: 5 / IN	Connection:	1.5" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Half	Hdr Material:	Schedule 40 Carbon Stl Header, Brazed Joints	
Misc:		- Pneumatic Test	
			Dwg: CA-HW-100-15

Performance V

Pressure:	29.92	IN HG	Elevation:	Sea Level		
Airflow:	27,000.0	SCFM	Water			
System Face Area:	43.3	FT ²	Flow Rate:	30.00	GPM	
Standard Face Velocity:	623.1	FPM	Entering Temp:	180.0	°F	
Entering Dry Bulb Temp:	50.0	°F	Leaving Temp:	160.0	°F	
			Tube Velocity:	2.0	FPS	
Leaving Dry Bulb Temp:	60.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU	
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU				
Sensible Heat Load:	291.5	MBH				
Total Heat Load:	291.5	MBH				

Losses

Air Pressure Drop:	0.06	IN H2O	Fluid Pressure Drop:	2.5	FT H2O
--------------------	------	--------	----------------------	-----	--------

Comments:

Notes & Warnings:

- 56 Rated in accordance with AHRI Standard 410.
- 46 Total surface not used. Check rows calculated. Reduce fluid flow, rows, or fins per inch.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-2 CC

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
W-9.0AS-30.0 X 96.0-6-1	4	96.00	1,825

Coil Type: W	Totals:	4	1,825
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes	
TF: 20	Fin Material:	Aluminum Star	Thickness: 0.0075 IN.
Row: 6	Csg Material:	1" Leg with 304 Stainless Casings	
Fin: 9 / IN	Connection:	2" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Full	Hdr Material:	Standard Carbon Stl, Brazed Joints	
	Misc:	- Pneumatic Test	
		Dwg: CA-W-100-25	

Performance V

Pressure:	29.92	IN HG	Elevation:	Sea Level
Airflow:	39,700.0	SCFM	Water	
System Face Area:	80.0	FT ²	Flow Rate:	266.00 GPM
Standard Face Velocity:	496.3	FPM	Entering Temp:	44.0 °F
Entering Dry Bulb Temp:	77.7	°F	Leaving Temp:	54.0 °F
Entering Wet Bulb Temp:	64.4	°F	Tube Velocity:	3.5 FPS
Leaving Dry Bulb Temp:	54.0	°F	Inside Surface Fouling:	0.0000 HR·FT ² ·°F/BTU
Leaving Wet Bulb Temp:	53.1	°F		
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU		
Sensible Heat Load:	1,017.2	MBH		
Total Heat Load:	1,330.0	MBH		
Losses				
Air Pressure Drop:	0.52	IN H2O	Fluid Pressure Drop:	11.1 FT H2O

Comments:

Notes & Warnings:
56 Rated in accordance with AHRI Standard 410.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-2 HW

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-6.0AS-30.0 X 144.0-2-1	2	144.00	513

Coil Type: HW	Totals:	2	513	
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes		
TF: 20	Fin Material:	Aluminum Star	Thickness: 0.0075	IN.
Row: 2	Csg Material:	1" Leg with 304 Stainless Casings		
Fin: 6 / IN	Connection:	2" Threaded, Carbon Stl, Extended 5 inches		
Circuit: Full	Hdr Material:	Schedule 40 Carbon Stl Header, Silver Brazed Joints		
	Misc:	- Pneumatic Test		
			Dwg: CA-HW-100-15	

Performance V

Pressure:	29.92	IN HG	Elevation:	Sea Level		
Airflow:	39,700.0	SCFM	Water			
System Face Area:	60.0	FT ²	Flow Rate:	208.00	GPM	
Standard Face Velocity:	661.7	FPM	Entering Temp:	180.0	°F	
Entering Dry Bulb Temp:	11.0	°F	Leaving Temp:	160.0	°F	
			Tube Velocity:	5.5	FPS	
Leaving Dry Bulb Temp:	58.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU	
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU				
Sensible Heat Load:	2,012.8	MBH				
Total Heat Load:	2,012.8	MBH				

Losses

Air Pressure Drop:	0.15	IN H2O	Fluid Pressure Drop:	12.5	FT H2O
--------------------	------	--------	----------------------	------	--------

Comments:

Notes & Warnings:

56 Rated in accordance with AHRI Standard 410.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-2 HW (Morning Warm)

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-6.0AS-30.0 X 144.0-2-1	2	144.00	513

Coil Type: HW	Totals:	2	513	
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes		
TF: 20	Fin Material:	Aluminum Star	Thickness: 0.0075	IN.
Row: 2	Csg Material:	1" Leg with 304 Stainless Casings		
Fin: 6 / IN	Connection:	2" Threaded, Carbon Stl, Extended 5 inches		
Circuit: Full	Hdr Material:	Schedule 40 Carbon Stl Header, Silver Brazed Joints		
	Misc:	- Pneumatic Test		
			Dwg: CA-HW-100-15	

Performance V

Pressure:	29.92	IN HG	Elevation:	Sea Level		
Airflow:	39,700.0	SCFM	Water			
System Face Area:	60.0	FT ²	Flow Rate:	133.00	GPM	
Standard Face Velocity:	661.7	FPM	Entering Temp:	180.0	°F	
Entering Dry Bulb Temp:	60.0	°F	Leaving Temp:	160.0	°F	
			Tube Velocity:	3.5	FPS	
Leaving Dry Bulb Temp:	90.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU	
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU				
Sensible Heat Load:	1,287.1	MBH				
Total Heat Load:	1,287.1	MBH				
Losses						
Air Pressure Drop:	0.16	IN H2O	Fluid Pressure Drop:	5.2	FT H2O	

Comments:

Notes & Warnings:	
56	Rated in accordance with AHRI Standard 410.
46	Total surface not used. Check rows calculated. Reduce fluid flow, rows, or fins per inch.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-2 REHEAT HW

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-5.0AS-30.0 X 144.0-1-0.5	2	144.00	342

Coil Type: HW	Totals:	2	342
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes, Orificed Tubes	
TF: 20	Fin Material:	Aluminum Star	Thickness: 0.0075 IN.
Row: 1	Csg Material:	1" Leg with 304 Stainless Casings	
Fin: 5 / IN	Connection:	1.5" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Half	Hdr Material:	Schedule 40 Carbon Stl Header, Silver Brazed Joints	
Misc:		- Pneumatic Test	
			Dwg: CA-HW-100-15

Performance V

Pressure:	29.92	IN HG	Elevation:	Sea Level		
Airflow:	39,700.0	SCFM	Water			
System Face Area:	60.0	FT ²	Flow Rate:	44.00	GPM	
Standard Face Velocity:	661.7	FPM	Entering Temp:	180.0	°F	
Entering Dry Bulb Temp:	50.0	°F	Leaving Temp:	160.0	°F	
			Tube Velocity:	2.4	FPS	
Leaving Dry Bulb Temp:	60.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU	
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU				
Sensible Heat Load:	428.7	MBH				
Total Heat Load:	428.7	MBH				
Losses						
Air Pressure Drop:	0.07	IN H2O	Fluid Pressure Drop:	3.8	FT H2O	

Comments:

Notes & Warnings:	
56	Rated in accordance with AHRI Standard 410.
46	Total surface not used. Check rows calculated. Reduce fluid flow, rows, or fins per inch.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-3 CC

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
W-9.0AS-24.0 X 71.0-6-1	4	71.00	1,150

Coil Type: W	Totals:	4	1,150
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes	
TF: 16	Fin Material:	Aluminum Star	Thickness: 0.0075 IN.
Row: 6	Csg Material:	1" Leg with 304 Stainless Casings	
Fin: 9 / IN	Connection:	2" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Full	Hdr Material:	Standard Carbon Stl, Brazed Joints	
Misc:		- Pneumatic Test	
			Dwg: CA-W-100-25

Performance V

Pressure: 29.92 IN HG Elevation: Sea Level

Airflow:	23,500.0	SCFM	Water		
System Face Area:	47.3	FT ²	Flow Rate:	193.00	GPM
Standard Face Velocity:	496.5	FPM	Entering Temp:	44.0	°F
Entering Dry Bulb Temp:	80.8	°F	Leaving Temp:	54.0	°F
Entering Wet Bulb Temp:	67.6	°F	Tube Velocity:	3.2	FPS
Leaving Dry Bulb Temp:	55.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU
Leaving Wet Bulb Temp:	54.3	°F			
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU			
Sensible Heat Load:	655.0	MBH			
Total Heat Load:	963.3	MBH			

Losses

Air Pressure Drop: 0.55 IN H2O Fluid Pressure Drop: 6.9 FT H2O

Comments:

Notes & Warnings:

56 Rated in accordance with AHRI Standard 410.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-3 HW

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-6.0AS-24.0 X 111.0-2-1	2	111.00	361

Coil Type: HW	Totals: 2	361
Coil Hand: Unspecified	Tube: 0.625 inch X 0.020 inch Copper Seamless Tubes, Orificed Tubes	
TF: 16	Fin Material: Aluminum Star	Thickness: 0.0075 IN.
Row: 2	Csg Material: 1" Leg with 304 Stainless Casings	
Fin: 6 / IN	Connection: 2" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Full	Hdr Material: Schedule 40 Carbon Stl Header, Brazed Joints	

Misc: - Pneumatic Test

Dwg: CA-HW-100-15

Performance V

Pressure: 29.92 IN HG Elevation: Sea Level

Airflow:	23,500.0	SCFM	Water
System Face Area:	37.0	FT ²	Flow Rate: 123.00 GPM
Standard Face Velocity:	635.1	FPM	Entering Temp: 180.0 °F
Entering Dry Bulb Temp:	11.0	°F	Leaving Temp: 160.0 °F
			Tube Velocity: 4.1 FPS
Leaving Dry Bulb Temp:	58.0	°F	Inside Surface Fouling: 0.0000 HR·FT ² ·°F/BTU
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU	
Sensible Heat Load:	1,191.4	MBH	
Total Heat Load:	1,191.4	MBH	

Losses

Air Pressure Drop: 0.14 IN H2O Fluid Pressure Drop: 8.9 FT H2O

Comments:

Notes & Warnings:

56 Rated in accordance with AHRI Standard 410.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-3 HW (Morning Warm)

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-6.0AS-24.0 X 111.0-2-1	2	111.00	361

Coil Type: HW	Totals:	2	361
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes, Orificed Tubes	
TF: 16	Fin Material:	Aluminum Star	Thickness: 0.0075 IN.
Row: 2	Csg Material:	1" Leg with 304 Stainless Casings	
Fin: 6 / IN	Connection:	2" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Full	Hdr Material:	Schedule 40 Carbon Stl Header, Brazed Joints	
Misc:		- Pneumatic Test	
			Dwg: CA-HW-100-15

Performance V

Pressure:	29.92	IN HG	Elevation:	Sea Level		
Airflow:	23,500.0	SCFM	Water			
System Face Area:	37.0	FT ²	Flow Rate:	79.00	GPM	
Standard Face Velocity:	635.1	FPM	Entering Temp:	180.0	°F	
Entering Dry Bulb Temp:	60.0	°F	Leaving Temp:	160.0	°F	
			Tube Velocity:	2.6	FPS	
Leaving Dry Bulb Temp:	90.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU	
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU				
Sensible Heat Load:	761.9	MBH				
Total Heat Load:	761.9	MBH				
Losses						
Air Pressure Drop:	0.15	IN H2O	Fluid Pressure Drop:	3.9	FT H2O	

Comments:

Notes & Warnings:	
56	Rated in accordance with AHRI Standard 410.
46	Total surface not used. Check rows calculated. Reduce fluid flow, rows, or fins per inch.



**PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS**

Date: 3/20/2024

System ID: AHU-3 REHEAT HW

Quote No. Q39755

Model No.	Qty. In Face	FL INCH	Total Weight LBS.
HW-5.0AS-24.0 X 111.0-1-0.5	2	111.00	251

Coil Type: HW	Totals:	2	251
Coil Hand: Unspecified	Tube:	0.625 inch X 0.020 inch Copper Seamless Tubes, Orificed Tubes	
TF: 16	Fin Material:	Aluminum Star	Thickness: 0.0075 IN.
Row: 1	Csg Material:	1" Leg with 304 Stainless Casings	
Fin: 5 / IN	Connection:	1.5" Threaded, Carbon Stl, Extended 5 inches	
Circuit: Half	Hdr Material:	Schedule 40 Carbon Stl Header, Silver Brazed Joints	
Misc:		- Pneumatic Test	
			Dwg: CA-HW-100-15

Performance V

Pressure:	29.92	IN HG	Elevation:	Sea Level		
Airflow:	23,500.0	SCFM	Water			
System Face Area:	37.0	FT ²	Flow Rate:	26.00	GPM	
Standard Face Velocity:	635.1	FPM	Entering Temp:	180.0	°F	
Entering Dry Bulb Temp:	50.0	°F	Leaving Temp:	160.0	°F	
			Tube Velocity:	1.7	FPS	
Leaving Dry Bulb Temp:	60.0	°F	Inside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU	
Outside Surface Fouling:	0.0000	HR·FT ² ·°F/BTU				
Sensible Heat Load:	253.7	MBH				
Total Heat Load:	253.7	MBH				

Losses

Air Pressure Drop:	0.06	IN H2O	Fluid Pressure Drop:	1.8	FT H2O
--------------------	------	--------	----------------------	-----	--------

Comments:

Notes & Warnings:

- 56 Rated in accordance with AHRI Standard 410.
- 46 Total surface not used. Check rows calculated. Reduce fluid flow, rows, or fins per inch.



Turn to the Experts.™

PRE-PURCHASE SPECIFICATIONS
AIR HANDLING UNITS

CARRIER CUSTOM 39CC

629 McCaffrey, Montreal,
Quebec Canada H4T 1N3
514-324-5050

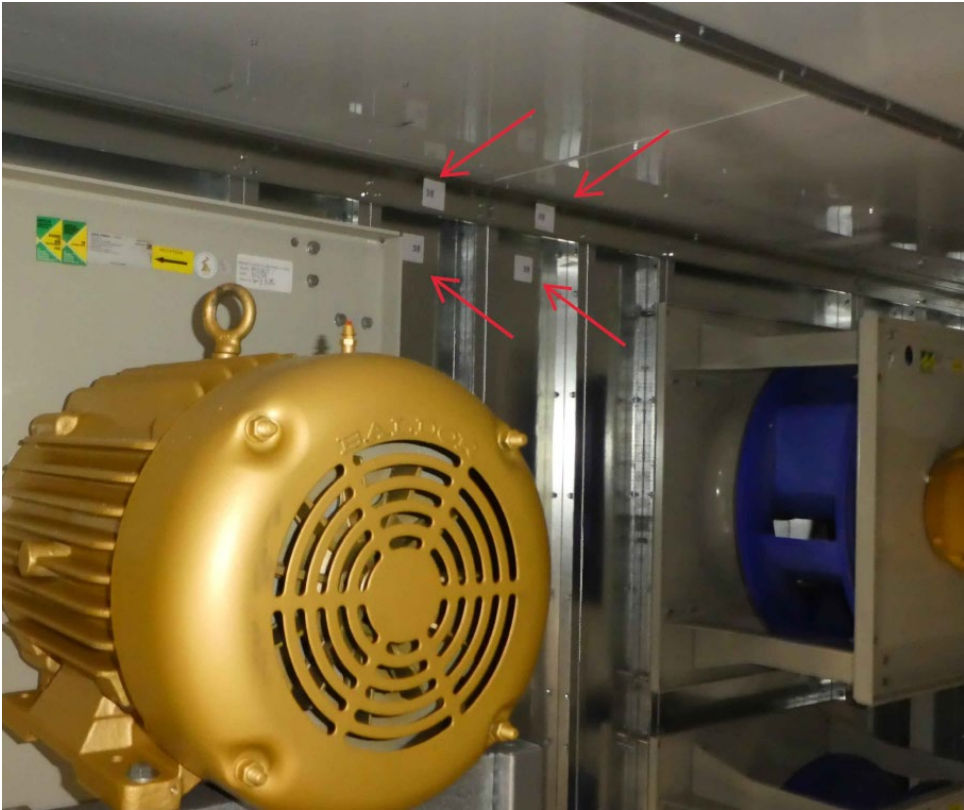
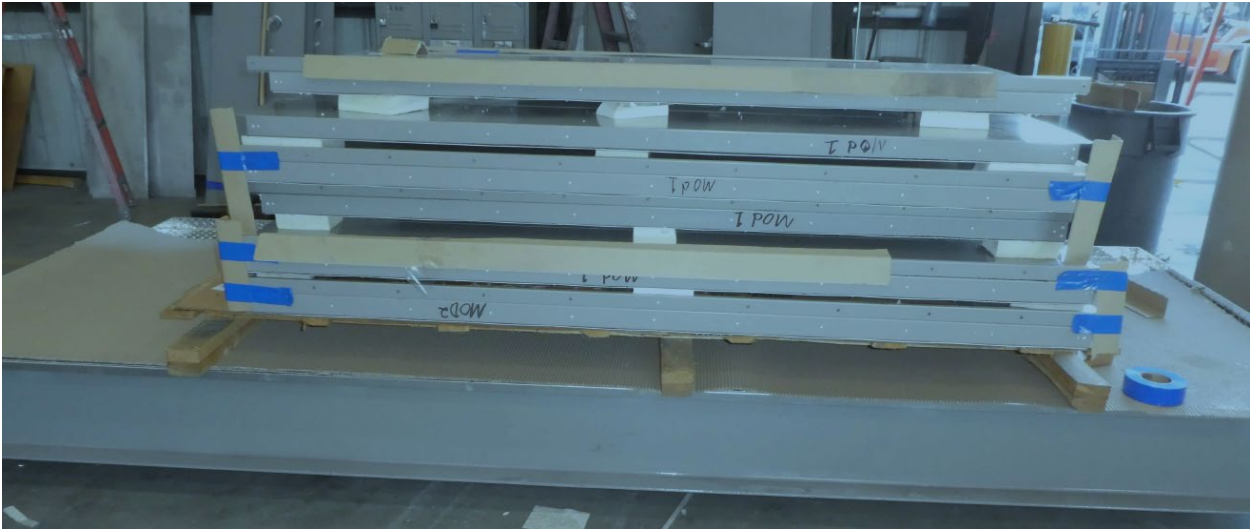
www.commercial.carrier.com

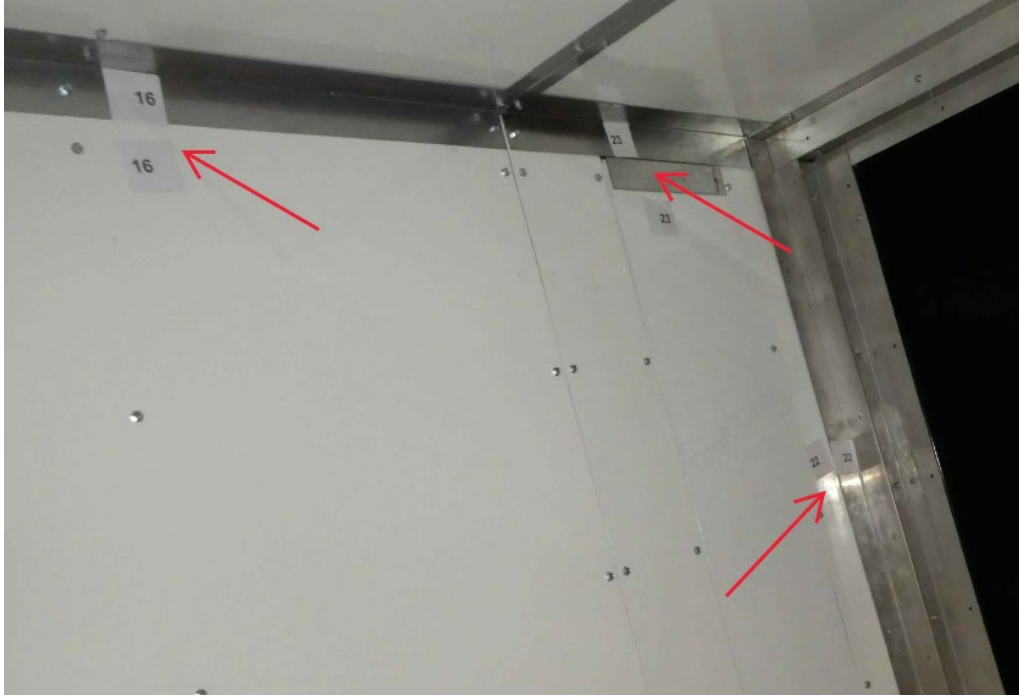
TYPICAL KNOCK DOWN
SHIPPING AND DOCUMENTATION

Knock down units are shipped on pallets.



Panels and components are labelled to facilitate installation.





Pallets will be numbered, and components itemized on Shipping list.

Shipping List

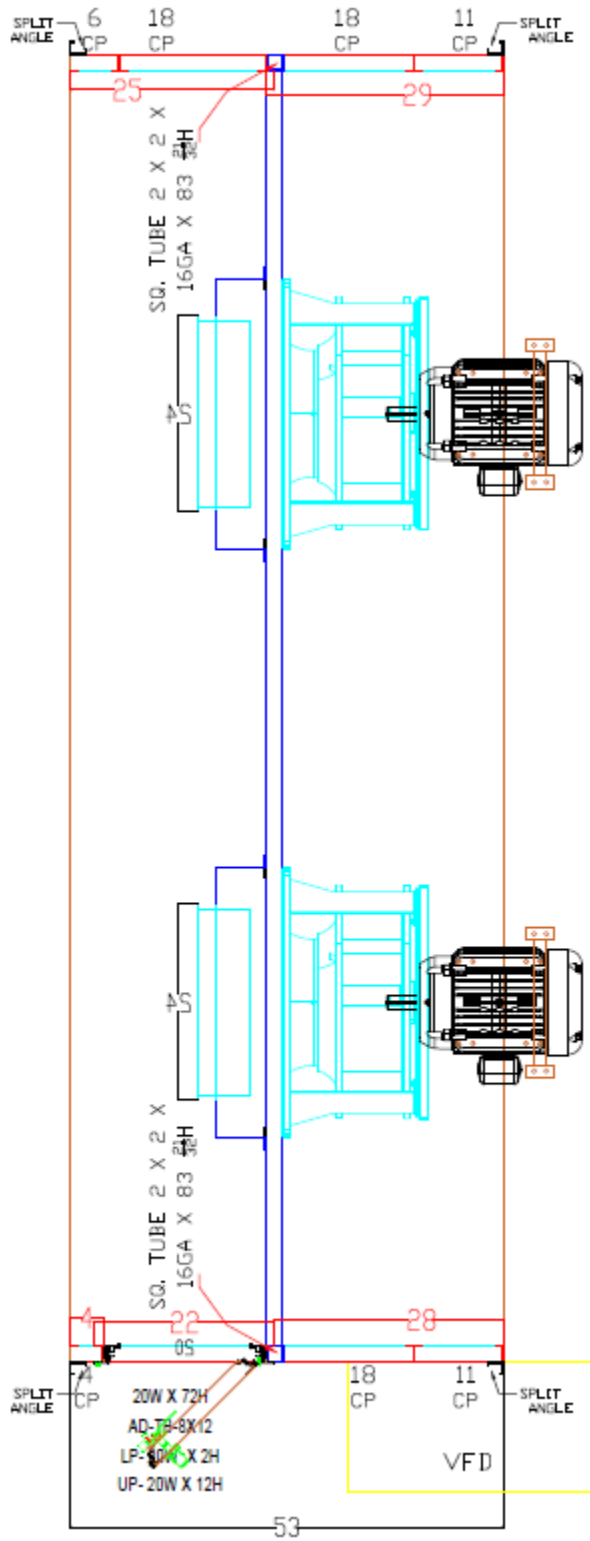
F-11-1

Rev 0

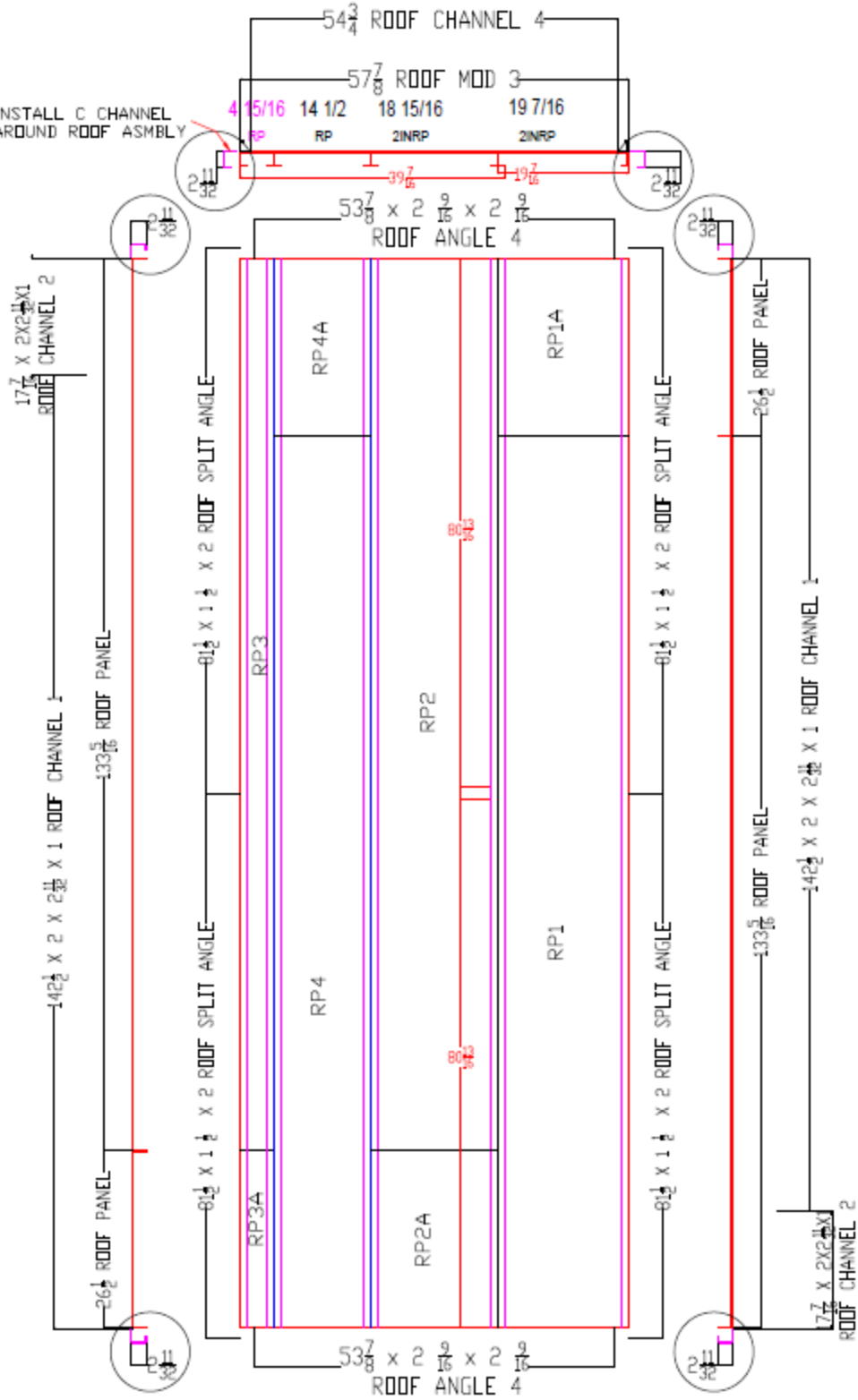
Released:

SHIPPED FROM:		DELIVER TO	DATE
12771 BROWN AVE		XYZ	SIGNATURE / DATE
RIVERSIDE CA 92509		1755 Ave	
(909) 823-1957			
			PAGE
		CONTACT / PH#	
SO / PO#			
PROJECT NAME:	XYZ PROJECT	PROJECT#	
PALLET 19			
UNIT	QUANTITY	DESCRIPTION	
	1	MODULE 5 BASE	
		WALLS AND ROOF	

Fabrication drawings showing assembly will be included with shipment.



INSTALL C CHANNEL
AROUND ROOF ASMBLY



CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

PRE-PURCHASE SPECIFICATIONS RETURN AIR FANS

PART 1 - GENERAL

1.01 SCOPE

- A. The purpose of this specification is to pre-purchase the return air fans associated with the new air handling units. The rigging of the equipment and accessories to their final location, installations, connections, and power and controls, will be provided by the installing contractor.
- B. In addition to furnishing the fans, the vendor shall list separate pricing for the following items.
 - 1. Shipping and handling costs FOB site.
 - 2. Fan inspection.
 - 3. Start-up service and Owner training
 - 4. Field performance verification

1.02 OWNER AND LOCATION

- A. The term Owner refers to Rowan University, 201 Mullica Hill Road, Glassboro, NJ 08028
- B. The term Site refers to the Campbell Library, Rowan University, 201 Mullica Hill Road, Glassboro, NJ 08028

1.03 ACCEPTANCE OR REJECTION OF PROPOSALS

- A. The Owner, in its sole discretion, may waive any informality in any proposal, may accept any proposal or may reject any or all proposals. The Owner shall announce the successful manufacturer within seven (7) days after opening of proposals, but such announcement shall not be construed as a rejection of any other proposal. The accepted manufacturer shall promptly execute the Contract and all related documents, which shall be prepared by the Owner. Upon failure of the accepted manufacturer to execute such documents within four (4) business days after they have been presented for execution, such manufacturer shall be disqualified.

1.04 ASSIGNMENT OF CONTRACT AND PAYMENT

- A. The Owner reserves the right to assign this Contract to the installing contractor for coordination and administration. In no event shall the responsibility of the manufacturer, toward the Owner, as specified, be abrogated. The manufacturer shall agree to terms and conditions in the Owner's, purchase order agreement and conditions specified herein.
- B. The manufacturer shall invoice for payment at time of shipping and Owner shall issue payment up to 90% of invoiced amount. The remaining 10% of the invoice shall be retained until acceptance by Owner.

1.05 CODES, RULES, PERMITS AND FEES

- A. Nothing contained in this specification shall be so construed as to conflict with the standards of the National Fire Protection Association, International Code Council, Buildings, Mechanical, Electrical, and Energy Codes, or any local, municipal, State or Federal regulation governing the installation of

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

the equipment specified herein, and the requirements of same. All such laws, ordinances and regulations, where they apply to this work, are hereby incorporated into and made a part of this Specification. Where applicable, materials and equipment shall bear stamps or seals of UL, IEEE, NEMA, ANSI, ASME, and other industry regulating groups. In case of difference between governing codes, specifications, laws, ordinances, industry and utility regulations, or contract documents, the most stringent shall govern. The manufacturer shall promptly notify the Owner, in writing, of such differences.

1.06 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new, shall bear manufacturer's name and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended.
- B. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage.
- C. No change in character or make of the material specified herein will be permitted at any time after the proposals are received. Manufacturers wishing changes must make written application to the Owner at least four (4) days prior to the time of closing of bids, and if such changes are approved by the Owner, each manufacturer who is involved will be so notified.

1.07 PROPOSAL REQUIREMENTS

- A. The Proposal to the Owner shall include preliminary drawings and performance data, sufficient to demonstrate that the physical sizes and unit performance capacities can be met. Dimensions and performance requirements are indicated on Drawing M603 in the Construction Contract Documents.
- B. Failure to provide dimensional drawings or unit sizes and configurations that vary from design requirements may result in disqualification of the bid as installation space is limited.

1.08 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of 25 years of experience in designing, manufacturing, and servicing air-handling units.
- B. The design indicated on the schedules and shown on the drawings is based upon the products of the named manufacturer. Alternate equipment manufacturers are acceptable if equipment meets scheduled performance requirements and dimensional requirements.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- E. Units shall conform to:
 - 1. AMCA (Air Movement and Control Association) Standard 99
 - 2. AMCA 210 and 211 for fan performance ratings.
 - 3. AMCA Standards 300 and 311
 - 4. AMCA Standard 500
 - 5. UL (Underwriters Laboratories) Standard 1995
- F. Unit shall conform to E.T.L. standards. Unit shall be ETL listed.
- G. Unit sound ratings shall be reported in accordance with AHRI 260 for inlet and discharge sound power levels.
- H. Unit casing radiated sound ratings shall be reported in accordance with ISO 9614 parts 1&2 and

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

ANSI S12.12.

- I. Unit shall have airflow performance certified to ANSI/AHRI 430.
- J. Motors covered by the Federal Energy Policy Act (EPACT) shall meet EPACT requirements.
- K. Damper performance shall comply with AMCA 500.
- L. Units shall be ISO 9001 certified.
- M. Units shall be manufactured in an ISO 9002 certified facility.
- N. Control Wiring comply with NEC codes & ETL requirements.
- O. Units shall comply with energy use AHSRAE 90.1.

1.09 SUBMITTAL DOCUMENTATION REQUIRED

- A. Submittals shall include the following:
 - 1. Unit drawings include plan and elevation views.
 - 2. Ladder type schematic drawing of power, control, and auxiliary utility field hookups, indicating all items that are furnished by the manufacturer.
 - 3. Manufacturer's performance data for each unit. As a minimum the following shall be provided:
 - a. Model number of unit
 - b. Unit dimensions
 - c. Approximate unit shipping weight
 - d. Rated load amps
 - e. Fan performance
- B. Furnish fan performance ratings and fan curves with specified operating point clearly plotted.
- C. Furnish drawings indicating unit dimensions, required clearances, field connection locations, wiring diagrams, and shipping drawings.
- D. Furnish performance report showing unit level performance data including: fan(s), motor(s), and other functional components.
- E. Furnish operation and maintenance data, including instructions for lubrication, motor and drive replacement, spare parts lists, and wiring diagrams.
- F. Adjust and report performance ratings for the proper altitude of operation.
- G. Report fan performance ratings in accordance with ANSI/AHRI-430 (static pressure, airflow, fan speed, and fan brake horsepower).
- H. Report unweighted octave band EF sound power for inlets and outlets rated in accordance with AHRI Standard 260. Provide eight data points, the first for the octave centered at 63 Hz, and the eighth centered at 8,000 Hz. Manufacturer shall not use sound estimates based on bare fan data (AMCA ratings), nor use calculations like the substitution method based on AHRI 260 tests of other EF products. Provide data for inlets and outlets as scheduled. Report unweighted casing radiated sound power over the same 8 octave bands in accordance with ISO 9614 Parts 1&2 and ANSI S12.12.
- I. Report electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- J. Report motor electrical characteristics.

1.10 QUALIFICATIONS

- A. Manufacturer shall specialize in the design and manufacture of commercial and industrial tubular mixed-flow fans.
- B. Units shall bear the ETL or UL label.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

1.11 OPERATING INSTRUCTIONS

- A. Manufacturer shall include with the equipment electronic copies of assembly and/or installation instructions, parts lists, and periodic maintenance instructions, for all equipment being purchased. These materials shall accompany the equipment and be clearly identified.
- B. Manufacturer shall provide assembly training by a factory certified instructor regarding disassembly/reassembly of the units as required for rigging. Training shall be for a minimum of 4 hours and a maximum of 8 hours.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. All indoor units shall be shipped completely covered in a polymer covering.
- B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish. All fans must be periodically rotated during storage period per manufacturer recommendation.

1.13 WARRANTY

- A. The complete unit shall be covered by a parts warranty issued by the manufacturer covering the first year of operation from the date of start-up or eighteen months from date of shipment, whichever comes first.
- B. The installing contractor shall provide labor warranty during the unit's first year of operation.

1.14 GUARANTEE

- A. Manufacturer shall guarantee all labor and materials for a period of one year for operation, which shall include agreement to repair, replace in location, and make good at his expense, any and all defects which may appear in his work or materials during that time which, in the judgment of the Owner, arise from defective workmanship or imperfect or inferior materials. The guarantee period shall start after the installation of the equipment is complete and accepted by the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Loren Cook Company, model QMXD.

2.02 MASTER CONTROL DOCUMENT FOR MANUFACTURING

- A. The approved submittal shall be the final document for manufacturing. The approved submittal shall supersede any other specifications.
- B. Except for approved submittals, any changes to a unit shall be made in writing.

2.03 CONSTRUCTION

- A. The fan shall be of welded and bolted construction utilizing corrosion resistant fasteners.
- B. Housing shall be minimum 14 gauge steel with integral inlet and outlet collars for slip fit duct

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

connections.

- C. Straightening vanes shall be included to assure maximum efficiency and low noise levels.
- D. For motors with grease fittings, extended lube lines shall be furnished for lubrication.
- E. Lifting lugs shall be provided for ease of installation.
- F. Mounting feet shall allow field selection of ceiling or floor mounting and multiple motor access locations.
- G. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

2.04 COATING

- A. Steel fan components shall be Lorenized™ with an electrostatically applied, baked polyester powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.

2.05 WHEEL

- A. Wheel shall be steel, non-overloading, high efficiency mixed-flow type. Contoured single thickness blades shall incorporate 3-D curvature for maximum efficiency across the entire surface of the blade. Blades shall be continuously welded to the backplate and inlet shroud. Hubs shall be keyed and securely attached to the motor shaft. Wheel shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

2.06 MOTOR

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC
- B. Motor shall be a TEFC furnished at the specified voltage and phase.

2.07 ACCESSORIES

- A. Provide variable frequency drive (VFD). The motor shall be rated for use with a VFD.
- B. Companion Flanges: For inlet and outlet duct connections.

2.08 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.01 INSTALLATION

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- A. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 1 inch. Vibration-control devices are specified in Phase 1 Specifications Section 230548.13 "Vibration Controls for HVAC."
- B. Install units with clearances for service and maintenance.
- C. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."
- D. Each fan shall be connected to ductwork with a flexible connection.

3.02 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to electrical specifications.
- D. Connect wiring according to electrical specifications.

3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. All fans which have complete motor controls to include overloads and circuit protection shall be factory run tested to insure proper fan RPM and operation. Testing the fans does not require load, static pressure, air velocity or performance testing. Testing the load, static pressure, air velocity or performance testing is optional and must be listed in the submittal. All electrical circuits shall be tested for correct operation and wiring integrity. Units shall pass quality control checks and must be thoroughly cleaned prior to shipment.
- C. Tests and Inspections:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust damper linkages for proper damper operation.
 - 6. Verify lubrication for bearings and other moving parts.
 - 7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 9. Shut unit down and reconnect automatic temperature-control operators.
 - 10. Remove and replace malfunctioning units and retest as specified above.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Prepare test and inspection reports.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

3.04 START-UP SERVICE

- A. Factory start-up assistance is available at an additional cost to be defined based on the jobsite location and number of units. Purchaser's Contractor is responsible for installation and start-up and the Seller will only provide onsite training and assistance for the contractor.
- B. Extended warranty of components may require installation by factory-certified technicians who are certified by the component manufacturer.

3.05 ENVIRONMENTAL REQUIREMENTS

- A. Contractor: Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings are lubricated, and fan has been test run under observation.
- B. Contractor: Do not store or use any hazardous materials or chemical on or in the unit.

3.06 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

END OF SECTION



COOK

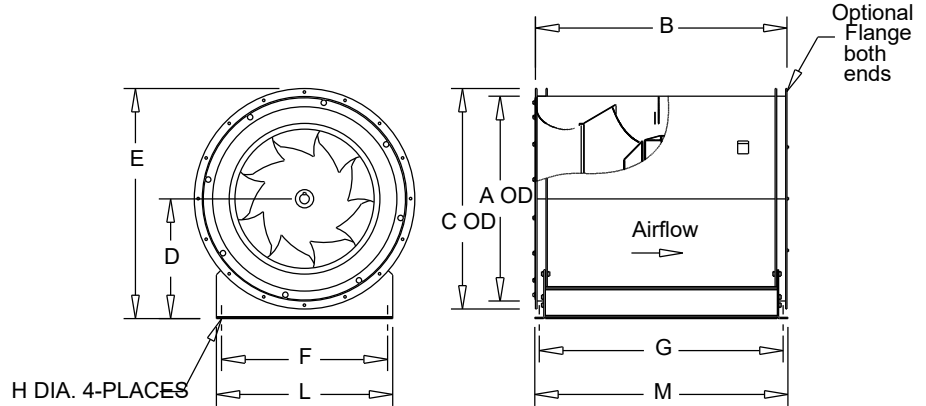


MARK: RF-1
PROJECT: ROWAN LIBRARY
DATE: 3/12/2024

QMXD-HP

**Mixed Flow Wheel
High Pressure
Horizontal Mount
Arr. 4**

STANDARD CONSTRUCTION FEATURES:
 High efficiency mixed flow wheel - Continuously welded steel housing with Lorenized powder coating - Welded aerodynamic straightening vanes - Integral inlet and outlet collars for slip fit duct connections - Extended lube lines with motor zerk - Lifting lugs - Adjustable mounting feet - Leads run to NEMA 1 Wiring Compartment.



Performance

Qty	Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power (HP)	FEG	FEI	Speed Ctrl/Hz
1	365QMXHPD11	27000	1.40	1066	12.6	80	1.05	VFD/55

Altitude (ft): 30 Temperature (F): 70

Motor Information

HP	RPM	Volts/Ph/Hz	Enclosure	FLA	VFD Rated
20	1140	460/3/60	TEFC -PE	27	Yes

NEMA Premium® efficiency motor per MG-1 (2014) Table 12-12
 FLA based on NEC (2017) Table 430.250

Fan Information

OVel(fpm)	Fan Mount	Wheel Width
1867	Horz. Ceiling	70%

Dimensions (inches)

A	51-3/4
B	64
C	54-3/4
D	29-13/16
E	57-3/16
F	40-1/2
G	63-3/8
H	13/16
L	42-1/2
M	65-1/4

NOTE: Accessories may affect dimensions shown.

Weight(lbs)***	Shipping	1907	Unit	1771
-----------------------	-----------------	-------------	-------------	-------------

***Includes fan, motor & accessories.

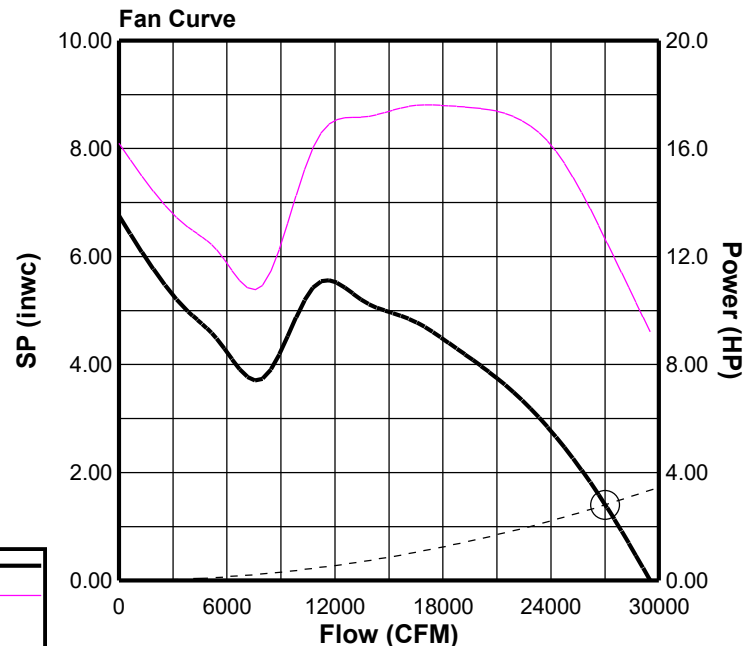
Sound Data Sound Power by Octave Band

	1	2	3	4	5	6	7	8	LwA	dBA
Inlet	87	92	93	88	83	85	80	71	91	80
Outlet	93	94	95	90	86	84	80	74	93	81

- Distance from Sound source 5 ft

Accessories:

- Premium Efficiency Motor (Min. 93.0%) w/SGR
- VFD BY OTHERS
- DISCONNECT NEMA 1
- ACCESS DOOR-BOLT
- INLT PIEZOMETRIC RNG
- SC-500 SET(4) - ISOLATORS





COOK



MARK: RF-1
PROJECT: ROWAN LIBRARY
DATE: 3/12/2024

QMXD-HP

Performance

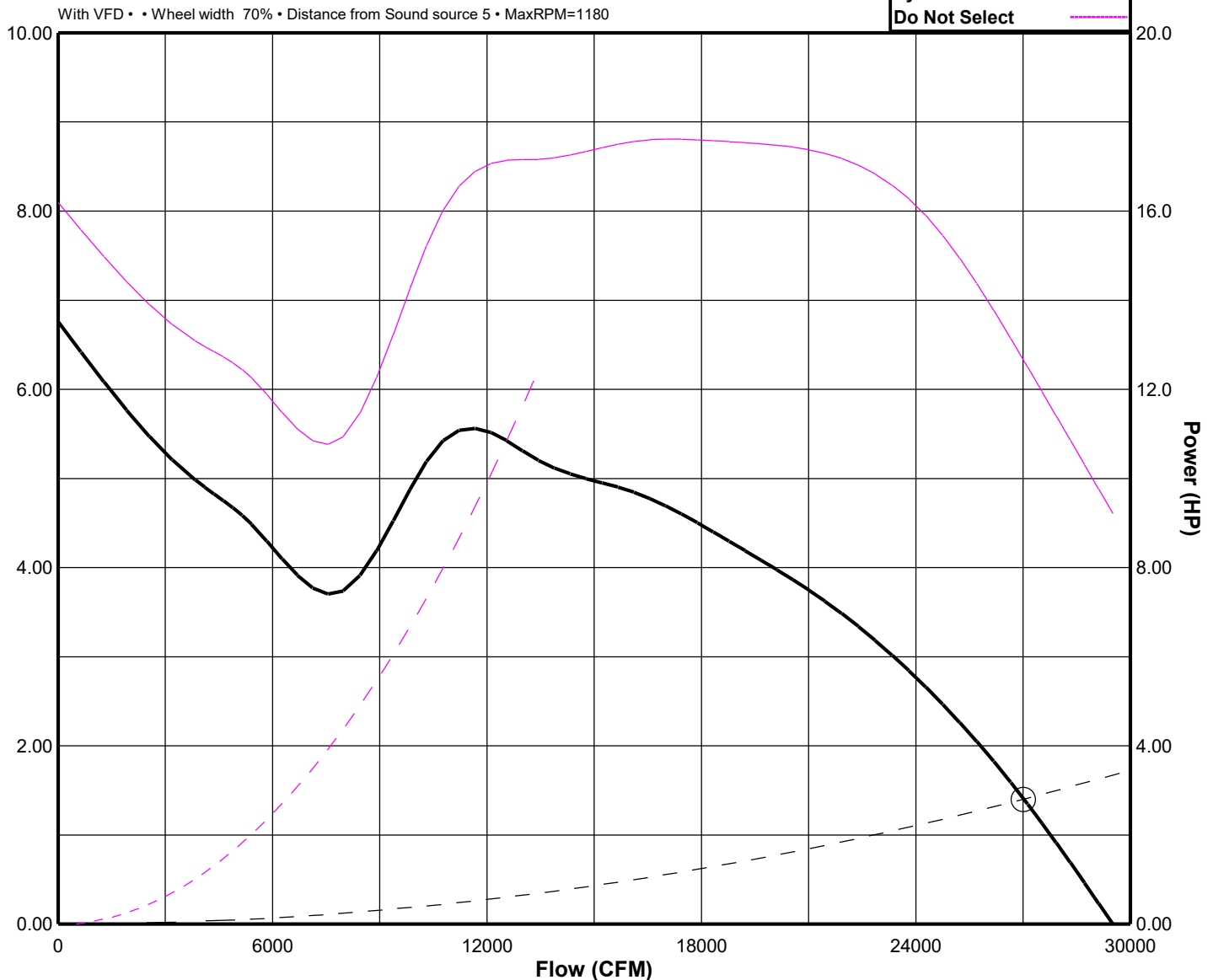
Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power (HP)	FEG	FEI	OVEL (fpm)	TSPD (fpm)	SE	Temp (°F)	ALT (ft)
365QMXHPD11	27000	1.40	1066	12.6	80	1.05	1867	10186	47%	70	30

Sound Data Sound Power by Octave Band

	1	2	3	4	5	6	7	8	LwA	dBA
Inlet	87	92	93	88	83	85	80	71	91	80
Outlet	93	94	95	90	86	84	80	74	93	81

Fan Curve Legend

CFM vs SP	—
CFM vs HP	—
Point of Operation	○
System Curve	- - -
Do Not Select	---





COOK

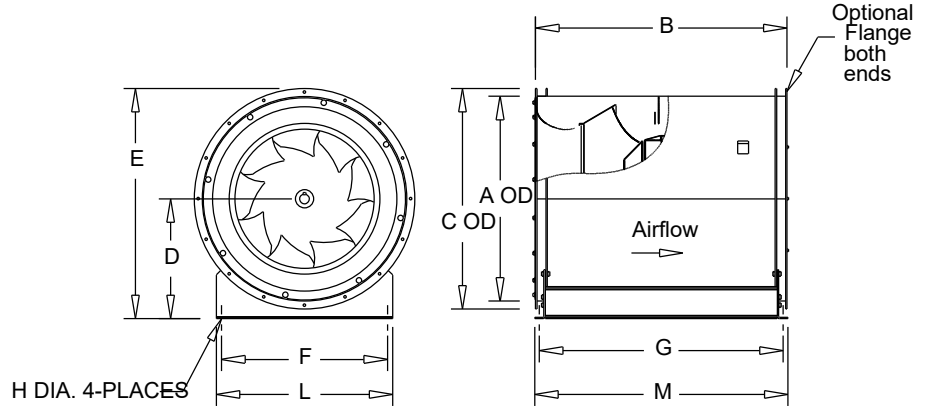


MARK: RF-2
PROJECT: ROWAN LIBRARY
DATE: 3/12/2024

QMXD-HP

Mixed Flow Wheel
High Pressure
Horizontal Mount
Arr. 4

STANDARD CONSTRUCTION FEATURES:
High efficiency mixed flow wheel - Continuously welded steel housing with Lorenized powder coating - Welded aerodynamic straightening vanes - Integral inlet and outlet collars for slip fit duct connections - Extended lube lines with motor zerk - Lifting lugs - Adjustable mounting feet - Leads run to NEMA 1 Wiring Compartment.



Performance

Qty	Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power (HP)	FEG	FEI	Speed Ctrl/Hz
1	402QMXHPD11	39700	1.40	1070	21.0	80	0.97	VFD/54

Altitude (ft): 30 Temperature (F): 70

Motor Information

HP	RPM	Volts/Ph/Hz	Enclosure	FLA	VFD Rated
30	1140	460/3/60	TEFC -PE	40	Yes

NEMA Premium® efficiency motor per MG-1 (2014) Table 12-12
FLA based on NEC (2017) Table 430.250

Fan Information

OVel(fpm)	Fan Mount	Wheel Width
2258	Horz. Ceiling	80%

Sound Data Sound Power by Octave Band

	1	2	3	4	5	6	7	8	LwA	dBA
Inlet	90	97	97	92	87	88	85	78	95	84
Outlet	96	98	98	94	89	88	86	81	97	85

- Distance from Sound source 5 ft

Accessories:

- Premium Efficiency Motor (Min. 93.6%) w/SGR
- VFD BY OTHERS
- ACCESS DOOR-BOLT
- INLT PIEZOMETRIC RNG
- SC-1000 SET(4) - ISOLATORS

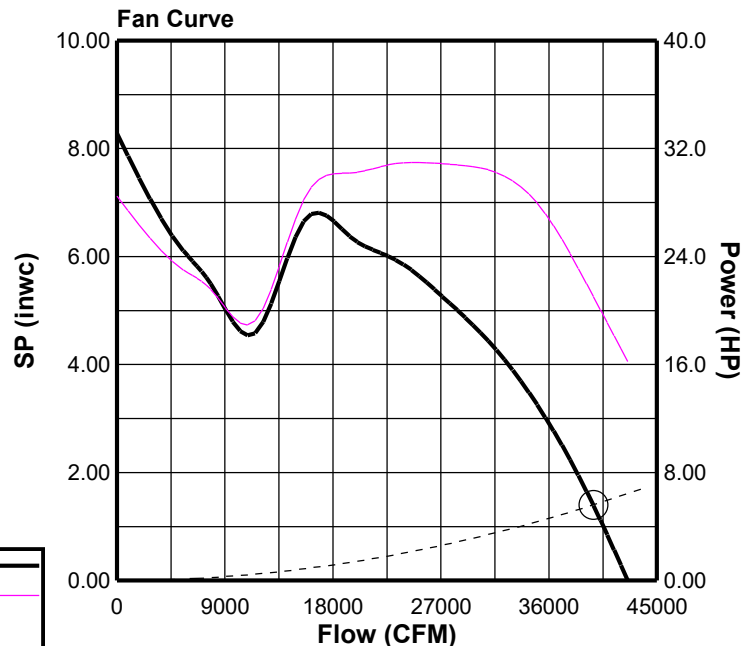
Dimensions (inches)

A	56-15/16
B	68-1/2
C	59-15/16
D	32-11/16
E	62-11/16
F	44
G	67-7/8
H	13/16
L	46
M	69-3/4

NOTE: Accessories may affect dimensions shown.

Weight(lbs)***	Shipping	2371	Unit	2225
----------------	----------	------	------	------

***Includes fan, motor & accessories.





COOK



MARK: RF-2
PROJECT: ROWAN LIBRARY
DATE: 3/12/2024

QMXD-HP

Performance

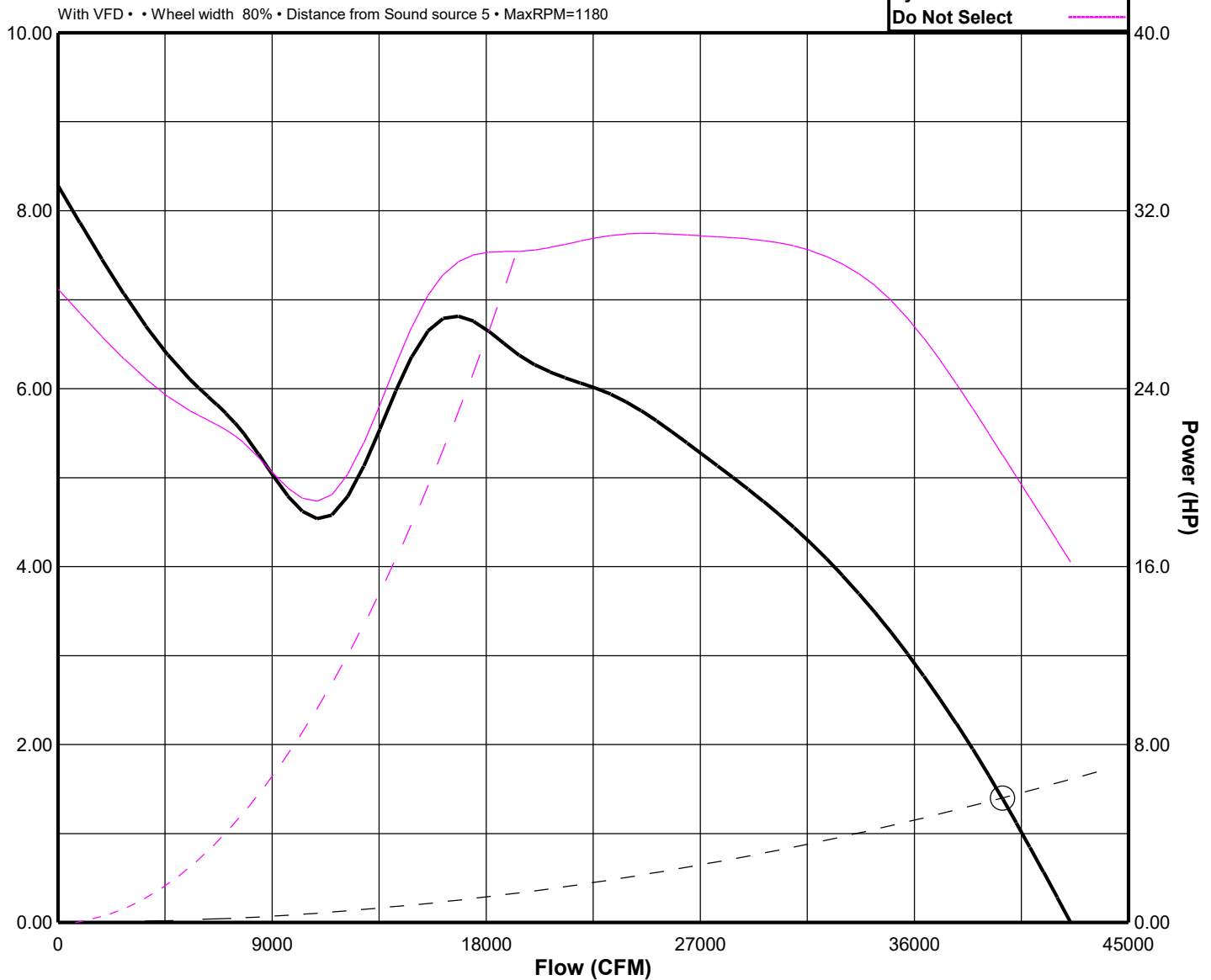
Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power (HP)	FEG	FEI	OVEL (fpm)	TSPD (fpm)	SE	Temp (°F)	ALT (ft)
402QMXHPD11	39700	1.40	1070	21.0	80	0.97	2258	11275	42%	70	30

Sound Data Sound Power by Octave Band

	1	2	3	4	5	6	7	8	LwA	dBA
Inlet	90	97	97	92	87	88	85	78	95	84
Outlet	96	98	98	94	89	88	86	81	97	85

Fan Curve Legend

CFM vs SP	—
CFM vs HP	—
Point of Operation	○
System Curve	- - -
Do Not Select	—





COOK

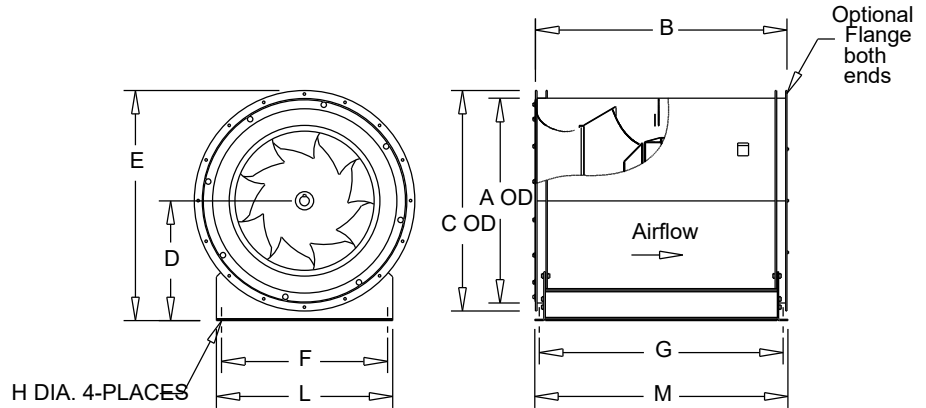


MARK: RF-3
PROJECT: ROWAN LIBRARY
DATE: 3/12/2024

QMXD-HP

Mixed Flow Wheel
High Pressure
Horizontal Mount
Arr. 4

STANDARD CONSTRUCTION FEATURES:
High efficiency mixed flow wheel - Continuously welded steel housing with Lorenized powder coating - Welded aerodynamic straightening vanes - Integral inlet and outlet collars for slip fit duct connections - Extended lube lines with motor zerk - Lifting lugs - Adjustable mounting feet - Leads run to NEMA 1 Wiring Compartment.



Performance

Qty	Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power (HP)	FEG	FEI	Speed Ctrl/Hz
1	330QMXHPD11	23500	1.40	1076	9.70	80	1.20	VFD/56

Altitude (ft): 30 Temperature (F): 70

Motor Information

HP	RPM	Volts/Ph/Hz	Enclosure	FLA	VFD Rated
15	1140	460/3/60	TEFC -PE	21	Yes

NEMA Premium® efficiency motor per MG-1 (2014) Table 12-12
FLA based on NEC (2017) Table 430.250

Fan Information

OVel(fpm)	Fan Mount
1988	Horz. Ceiling

Dimensions (inches)

A	46-3/4
B	58-1/2
C	49-3/4
D	27
E	51-7/8
F	36-3/4
G	57-1/8
H	11/16
L	38-3/4
M	58-3/4

NOTE: Accessories may affect dimensions shown.

Weight(lbs)***	Shipping	1502	Unit	1385
-----------------------	-----------------	------	-------------	------

***Includes fan, motor & accessories.

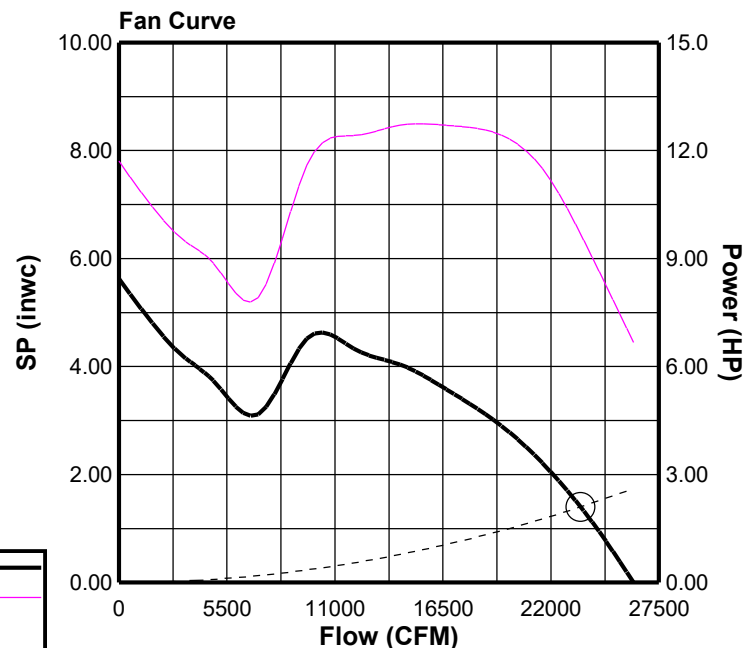
Sound Data Sound Power by Octave Band

	1	2	3	4	5	6	7	8	LwA	dBA
Inlet	87	90	92	86	82	83	78	69	90	78
Outlet	92	92	94	89	84	82	78	70	91	80

- Distance from Sound source 5 ft

Accessories:

- Premium Efficiency Motor (Min. 92.4%) w/SGR
- VFD BY OTHERS
- DISCONNECT NEMA 1
- ACCESS DOOR-BOLT
- INLT PIEZOMETRIC RNG
- SC-370 SET(4) - ISOLATORS





COOK



MARK: RF-3
PROJECT: ROWAN LIBRARY
DATE: 3/12/2024

QMXD-HP

Performance

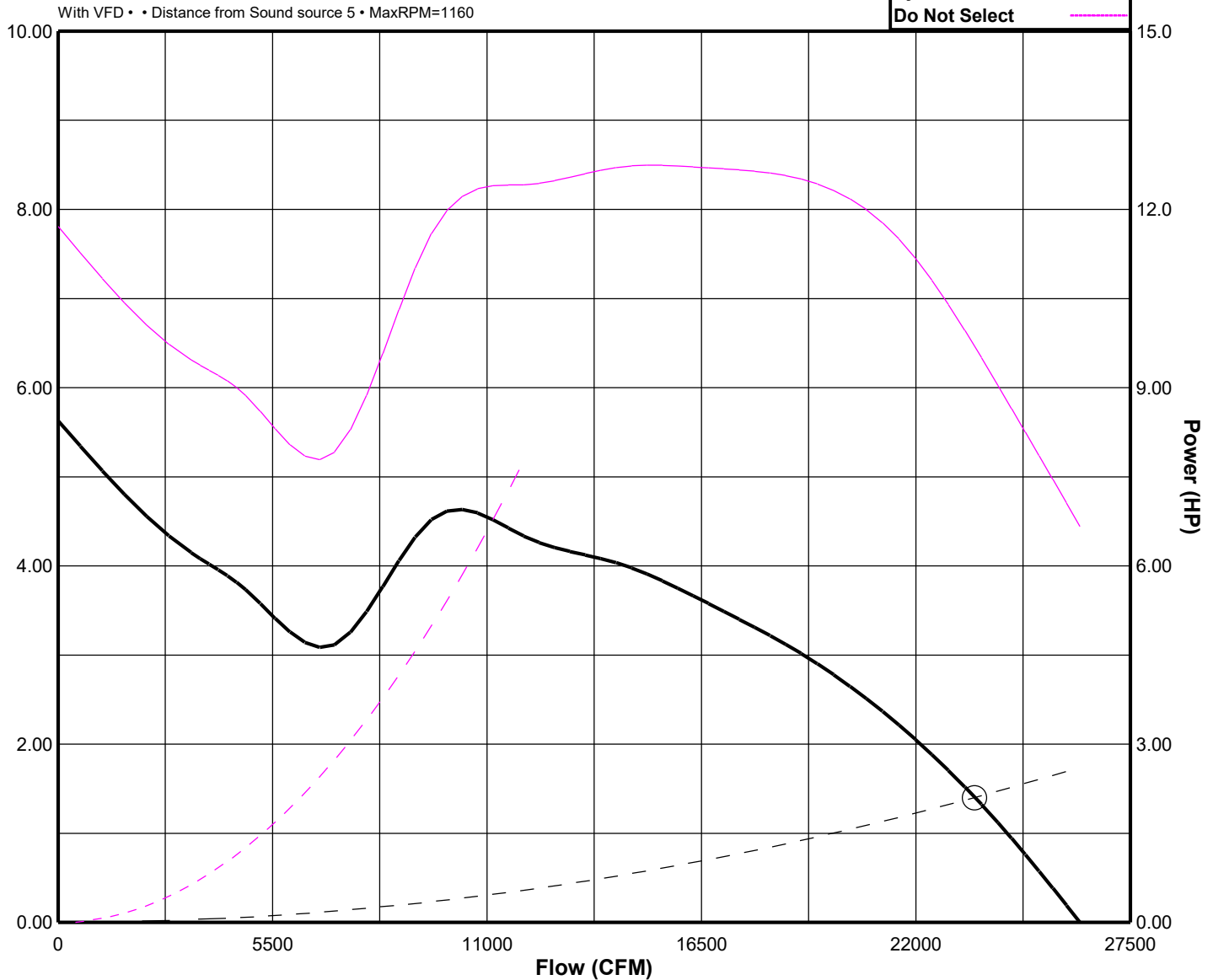
Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power (HP)	FEG	FEI	OVEL (fpm)	TSPD (fpm)	SE	Temp (°F)	ALT (ft)
330QMXHPD11	23500	1.40	1076	9.70	80	1.20	1988	9295	53%	70	30

Sound Data Sound Power by Octave Band

	1	2	3	4	5	6	7	8	LwA	dBA
Inlet	87	90	92	86	82	83	78	69	90	78
Outlet	92	92	94	89	84	82	78	70	91	80

Fan Curve Legend

CFM vs SP	—
CFM vs HP	—
Point of Operation	○
System Curve	- - -
Do Not Select	---



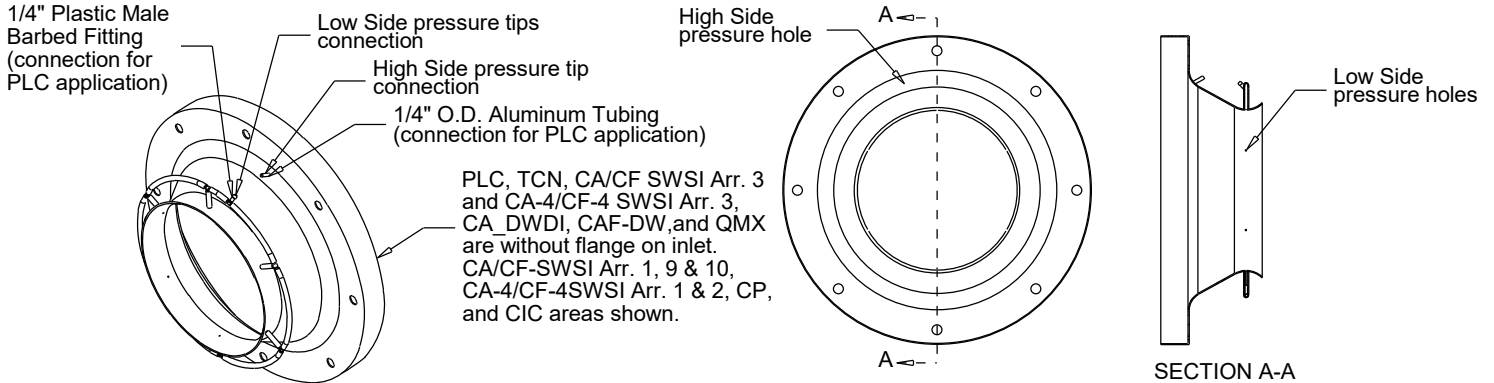


Inlet Piezometric Ring

Airflow Measuring Station

NOTES:

External 1/8" NPT male pressure fittings will be provided for all housed fans. For PLC applications inlet pressure connectors are provided as shown. Consult factory for optional arrangements. Standard piezometric ring is rated up to 180 deg F. High temperature options (limited to 300 deg F) are available upon request. This product is intended for clean air applications only.



Dimensions (inches)

Mark	Qty	Description
RF-1	1	INLT PIEZOMETRIC RNG
RF-2	1	INLT PIEZOMETRIC RNG
RF-3	1	INLT PIEZOMETRIC RNG



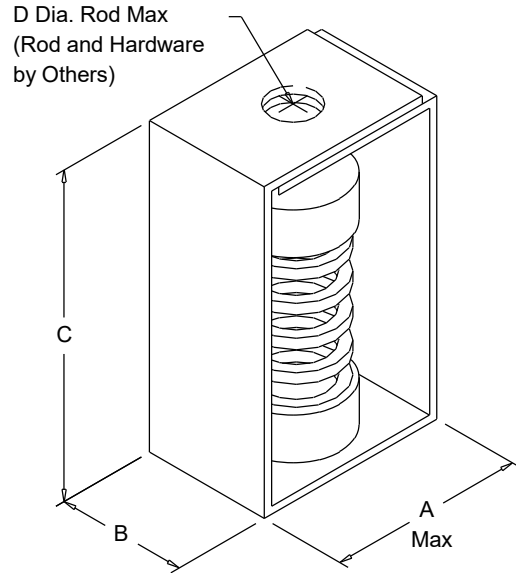
COOK

PROJECT: ROWAN LIBRARY

DATE: 3/12/2024

SPRING CEILING

Housing Spring
Spring Isolator
Ceiling Mounted



Dimensions (inches)

Mark	Qty	Description	A	B	C	D Dia.	Rated Deflection
RF-1	1	SC-500 SET(4)	3-11/16	2-1/4	5-1/4	5/8	1
RF-2	1	SC-1000 SET(4)	5-9/16	3-5/8	8-9/16	1	1.15
RF-3	1	SC-370 SET(4)	3-11/16	2-1/4	5-1/4	5/8	1

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

**PRE-PURCHASE SPECIFICATIONS
SPLIT AIR HANDLING UNITS**

PART 1 - GENERAL

1.01 SCOPE

- A. The purpose of this specification is to pre-purchase (2) split air handling unit heat pumps. The rigging of the equipment and accessories to their final location, installations, connections, and power and controls, will be provided by the installing contractor.
- B. In addition to furnishing the air handling units, the vendor shall include the following items on its bid pricing:
 - 1. Shipping and handling costs FOB site.
 - 2. AHU inspection
- C. The following items shall not be part of this pre-purchase bid, but shall be included in Phase 1 of the library project:
 - 1. Inspection and adjustment of fan assemblies.
 - 2. Start-up service and Owner training
 - 3. Field performance verification

1.02 OWNER AND LOCATION

- A. The term Owner refers to Rowan University, 201 Mullica Hill Road, Glassboro, NJ 08028
- B. The term Site refers to the Campbell Library, Rowan University, 201 Mullica Hill Road, Glassboro, NJ 08028

1.03 ACCEPTANCE OR REJECTION OF PROPOSALS

- A. The Owner, in its sole discretion, may waive any informality in any proposal, may accept any proposal or may reject any or all proposals. The Owner shall announce the successful manufacturer within seven (7) days after opening of proposals, but such announcement shall not be construed as a rejection of any other proposal. The accepted manufacturer shall promptly execute the Contract and all related documents, which shall be prepared by the Owner. Upon failure of the accepted manufacturer to execute such documents within four (4) business days after they have been presented for execution, such manufacturer shall be disqualified.

1.04 ASSIGNMENT OF CONTRACT AND PAYMENT

- A. The Owner reserves the right to assign this Contract to the installing contractor for coordination and administration. In no event shall the responsibility of the manufacturer, toward the Owner, as specified, be abrogated. The manufacturer shall agree to terms and conditions in the Owner's, purchase order agreement and conditions specified herein.
- B. The manufacturer shall invoice for payment at time of shipping and Owner shall issue payment up to 90% of invoiced amount. The remaining 10% of the invoice shall be retained until acceptance by Owner.

1.05 CODES, RULES, PERMITS AND FEES

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- A. Nothing contained in this specification shall be so construed as to conflict with the standards of the National Fire Protection Association, International Code Council, Buildings, Mechanical, Electrical, and Energy Codes, or any local, municipal, State or Federal regulation governing the installation of the equipment specified herein, and the requirements of same. All such laws, ordinances and regulations, where they apply to this work, are hereby incorporated into and made a part of this Specification. Where applicable, materials and equipment shall bear stamps or seals of UL, IEEE, NEMA, ANSI, ASME, and other industry regulating groups. In case of difference between governing codes, specifications, laws, ordinances, industry and utility regulations, or contract documents, the most stringent shall govern. The manufacturer shall promptly notify the Owner, in writing, of such differences.

1.06 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new, shall bear manufacturer's name and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended.
- B. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage.
- C. No change in character or make of the material specified herein will be permitted at any time after the proposals are received. Manufacturers wishing changes must make written application to the Owner at least four (4) days prior to the time of closing of bids, and if such changes are approved by the Owner, each manufacturer who is involved will be so notified.

1.07 PROPOSAL REQUIREMENTS

- A. The Proposal to the Owner shall include preliminary drawings and performance data, sufficient to demonstrate that the physical sizes and unit performance capacities can be met. Dimensions and performance requirements are indicated on Drawing M603 in the Construction Contract Documents.
- B. Failure to provide dimensional drawings or unit sizes and configurations that vary from design requirements may result in disqualification of the bid as installation space is limited.

1.08 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of 25 years of experience in designing, manufacturing, and servicing air-handling units.
- B. The design indicated on the schedules and shown on the drawings is based upon the products of the named manufacturer. Alternate equipment manufacturers are acceptable if equipment meets scheduled performance requirements and dimensional requirements.

1.09 RATINGS AND CERTIFICATIONS

- A. Indoor Unit:
1. All coils shall be designed and tested in accordance with ASHRAE 15 Safety Code for Mechanical Refrigeration, latest edition.
 2. Unit shall be constructed in accordance with ETL and ETL, Canada, standards and shall carry the ETL and ETL, Canada, labels.
 3. Unit insulation and adhesive shall comply with NFPA-90A requirements for flame spread and

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

smoke generation. Insulation shall be treated with an immobilized antimicrobial agent to inhibit the growth of bacteria and fungi on the insulation as proven by tests in accordance with ASTM standards G21 and 22 (U.S.A.).

4. Unit shall be manufactured in a facility registered to the ISO 9001 manufacturing quality standard.
5. Direct-expansion coils shall be leak tested at 150 psig and pressure tested at 650 psig and qualified to UL burst test at 1980 psig.

B. Outdoor Unit:

1. Unit shall be rated in accordance with AHRI Standard 340/360.
2. Unit construction shall comply with ANSI/ASHRAE 15 safety code latest revision and comply with NEC.
3. Unit shall be constructed in accordance with UL 1995 standard and shall carry the UL and UL, Canada label for sizes 07-12 and ETL for 16 and 25 models.
4. Unit cabinet shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
5. Air-cooled outdoor coils shall be leak tested at 150 psig and pressure tested at 650 psig and qualified to UL burst test at 1980 psig.
6. Unit shall be manufactured in a facility registered to ISO 9001 manufacturing quality standard.

1.10 SUBMITTAL DOCUMENTATION REQUIRED

A. Submittals shall include the following:

1. Unit drawings include plan and elevation views.
2. Ladder type schematic drawing of power, control, and auxiliary utility field hookups, indicating all items that are furnished by the manufacturer.
3. Manufacturer's performance data for each unit. As a minimum the following shall be provided:
 - a. Model number of unit
 - b. Unit dimensions
 - c. Approximate unit shipping weight
 - d. Rated load amps
 - e. Fan performance
 - f. Coil performance

B. Furnish fan performance ratings and fan curves with specified operating point clearly plotted.

C. Furnish drawings indicating unit dimensions, required clearances, field connection locations, wiring diagrams, shipping drawings, and curb drawings.

D. Furnish performance report showing unit level performance data including: fan(s), motor(s), coil(s) and other functional components. Performance report shall also include unit casing performance.

E. Furnish operation and maintenance data, including instructions for lubrication, filter replacement, motor and drive replacement, and condensate pan cleaning; spare parts lists, and wiring diagrams.

F. Adjust and report performance ratings for the proper altitude of operation.

G. Report air-handling unit performance ratings in accordance with ANSI/AHRI-430 (static pressure, airflow, fan speed, and fan brake horsepower).

H. Report static pressure profiles by component section.

I. Report coil ratings in accordance with AHRI-410 (capacities and pressure drops).

J. Report unweighted octave band AHU sound power for inlets and outlets rated in accordance with AHRI Standard 260. Provide eight data points, the first for the octave centered at 63 Hz, and the

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

eighth centered at 8,000 Hz. Manufacturer shall not use sound estimates based on bare fan data (AMCA ratings), nor use calculations like the substitution method based on AHRI 260 tests of other AHU products. Provide data for inlets and outlets as scheduled. Report unweighted casing radiated sound power over the same 8 octave bands in accordance with ISO 9614 Parts 1&2 and ANSI S12.12.

- K. Airflow measuring device performance shall be certified and rated in accordance with AMCA-611. Report data in accordance with AMCA-611. Provide AMCA Certified Rating Seal for Airflow Measurement Performance.
- L. Report panel deflection at +/-8" w.g., stated in terms of 'L/X' where 'L' is the casing panel length and 'X' is a constant provided by the AHU manufacturer.
- M. Report casing leakage rate at +/-8" w.g., specified in terms of percentage of design airflow.
- N. Report weight loads and distributions by component section.
- O. Report product data for filter media, filter performance data, filter assembly, and filter frames.
- P. Report electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- Q. Report motor electrical characteristics.

1.11 QUALIFICATIONS

- A. Manufacturer shall specialize in the design and manufacture of commercial and industrial custom air-handling equipment.
- B. Units shall bear the ETL or UL label.

1.12 OPERATING INSTRUCTIONS

- A. Manufacturer shall include with the equipment electronic copies of assembly and/or installation instructions, parts lists, and periodic maintenance instructions, for all equipment being purchased. These materials shall accompany the equipment and be clearly identified.
- B. Manufacturer shall provide assembly training by a factory certified instructor regarding disassembly/reassembly of the units as required for rigging. Training shall be for a minimum of 4 hours and a maximum of 8 hours.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. All indoor units shall be shipped completely covered in a polymer covering.
- B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish. All fans must be periodically rotated during storage period per manufacturer recommendation.

1.14 WARRANTY

- A. The complete unit shall be covered by a parts warranty issued by the manufacturer covering the first year of operation from the date of start-up or eighteen months from date of shipment, whichever comes first.
- B. The installing contractor shall provide labor warranty during the unit's first year of operation.

1.15 GUARANTEE

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- A. Manufacturer shall guarantee all labor and materials for a period of one year for operation, which shall include agreement to repair, replace in location, and make good at his expense, any and all defects which may appear in his work or materials during that time which, in the judgment of the Owner, arise from defective workmanship or imperfect or inferior materials. The guarantee period shall start after the installation of the equipment is complete and accepted by the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Carrier Model Numbers 40RUQ (Indoor Units) and 38AUQ07 (Outdoor Units)

2.02 MASTER CONTROL DOCUMENT FOR MANUFACTURING

- A. The approved submittal shall be the final document for manufacturing. The approved submittal shall supersede any other specifications.
B. Except for approved submittals, any changes to a unit shall be made in writing.

2.03 SYSTEM DESCRIPTION

A. Indoor Units:

1. Indoor, packaged air-handling unit for use in commercial heat pump split systems. Unit shall have a multi-position design and shall be capable of horizontal or vertical installation on a floor or in a ceiling, with or without ductwork. (Only vertical units are to be applied without ductwork.) Unit shall function as the indoor component of an air-to-air electric heat pump system.

B. Outdoor Units:

1. Outdoor-mounted, electrically controlled, air-cooled split system heat pump suitable for on-the-ground or rooftop installation. Unit shall consist of a scroll air-conditioning compressor assembly, an air-cooled coil, propeller-type condenser fans, and a control box. Unit shall discharge supply air upward as shown on contract drawings. Unit shall function as the outdoor component of an air to air electric heat pump system.

- C. Unit must be designed with a Puron® (R-410A) refrigerant circuit with a matching air-cooled condensing unit 38AUQ, for matched systems approved by the manufacturer.

2.04 INDOOR AHUs

A. Base Unit:

1. Cabinet shall be constructed of mill-galvanized steel.
2. Cabinet panels shall be fully insulated with 1/2 in. fire-retardant material. Insulation shall be treated with an immobilized antimicrobial agent to inhibit the growth of bacteria and fungi on the insulation as proven by tests in accordance with ASTM standards G21 and 22 (U.S.A.).
3. Unit shall contain corrosion-free condensate drain pans for both vertical and horizontal applications. Drain pans shall have connections on right and left sides of unit to facilitate field connection. Drain pans shall have the ability to be sloped toward the right or left side of the

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- unit to prevent standing water from accumulating in pans.
4. Unit shall have factory-supplied 2 in. throw-away-type filters installed upstream from the cooling coil. Filter access shall be from either the right or left side of the unit.
- B. Coils:
1. Coils shall consist of 3 rows (40RUQ*07) or 4 rows (40RUQ*08-25) of copper tubes with sine-wave aluminum fins bonded to the tubes by mechanical expansion. Coil tubing shall be internally rifled to maximize heat transfer. Refrigerant line connections shall be made on the same side of the coil.
 2. Coils shall feature factory-installed thermostatic expansion valves (TXVs) for refrigerant control. The TXVs shall be capable of external adjustment.
 3. Coils shall have a factory-installed bypass line and check valve assembly around the TXVs to allow liquid flow from the coil to the outdoor unit during heating mode.
- C. Operating Characteristics:
1. When combined with the matching 38AUQ condensing unit the system shall be capable of starting and running up to 125°F (52°C) and down to 35°F (2°C) ambient outdoor temperature.
 2. Unit shall operate at +/-10% from rated voltage.
- D. Motor:
1. Fan motor of the size and electrical characteristics specified on the equipment schedule shall be factory-supplied and factory-installed.
 2. Indoor-fan motor shall have permanently lubricated, sealed bearings and inherent automatic-reset thermal overload protection (motors smaller than 5 hp) or manual reset calibrated circuit breakers (motors equal or larger than 5 hp). Indoor motors are designed specifically for Carrier and do not have conventional horsepower (hp) ratings listed on the motor nameplate. Motors are designed and qualified in the “air-over” location downstream of the cooling coil and carry a maximum continuous bhp rating that is the maximum application bhp rating for the motors; no “safety factors” above that rating may be applied.
 3. All indoor fan motors 5 hp and larger shall meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT), effective October 24, 1997.
 4. High efficient motors listed shall meet section 313 of the Energy Independence and Security Act of 2007 (EISA 2007).
- E. Special Features:
1. Alternate Motor and Drive:
 - a. An alternate motor and medium or high-static drive shall be available to meet the airflow and external static pressure requirements specified on the equipment schedule.
 2. External Paint Cabinet:
 - a. Where conditions require, units shall be painted with an American Sterling Gray finish.
 3. Air Discharge Plenum:
 - a. Plenum shall be factory-supplied to provide free-blow air distribution for vertical floor-mounted units. A grille with moveable vanes for horizontal or vertical airflow adjustment shall be included. Plenum housing shall be field-installed on the unit’s fan deck for blow-thru air distribution.
 4. Return Air Grille:
 - a. Grille shall be factory-supplied for field installation on the unit’s return air opening.
 5. Unit Subbase:
 - a. Subbase assembly shall be factory-supplied for field installation. Subbase shall

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

elevate floor-mounted vertical units to provide access for correct condensate drain connection.

6. Overhead Suspension Package:
 - a. Package shall include necessary brackets to support units in a horizontal ceiling installation.
7. Condensate Drain Trap:
 - a. Trap shall have transparent, serviceable design for easy cleaning. Kit shall also include overflow shutoff switch and wiring harness for connection to alarm if desired.
8. Staged Air Volume System (SAV) for 2-stage cooling models only:
 - a. Evaporator fan motor:
 - 1) Shall have permanently lubricated bearings.
 - 2) Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating.
 - 3) Shall be Variable Frequency duty and 2-speed control.
 - 4) Shall contain motor shaft grounding ring to prevent electrical bearing fluting damage by safely diverting harmful shaft voltages and bearing currents to ground.
9. Variable Frequency Drive (VFD). Only available on 2-speed indoor fan motor option Staged Air Volume System (SAV™):
 - a. Shall be installed inside the unit cabinet, mounted, wired and tested.
 - b. Shall contain Electromagnetic Interference (EMI) frequency protection.
 - c. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
 - d. Self diagnostics with fault and power code LED indicator. Field accessory Display kit available for further diagnostics and special setup applications.
 - e. RS485 capability standard
 - f. Electronic thermal overload protection
 - g. 5% swinging chokes for harmonic reduction and improved power factor.
 - h. All printed circuit boards shall be conformal coated.
10. Display Kit for Variable Frequency Drive:
 - a. Kit allows the ability to access the VFD controller programs to provide special setup capabilities and diagnostics.
 - b. Kit contains display module and communications cable.
 - c. Display Kit can be permanently installed in the unit or used on any SAV system VFD controller as needed.

F. OUTDOOR UNITS

1. General: Factory-assembled, single piece, air-cooled split system heat pump. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor, holding charge Puron® (R-410A), and special features required prior to field start-up.
2. Unit Cabinet:
 - a. Unit cabinet shall be constructed of galvanized steel, bonderized and coated with a pre-painted baked enamel finish.
 - b. A heavy-gauge roll-formed perimeter base rail with forklift slots and lifting holes shall be provided to facilitate rigging.
3. Fans:
 - a. Condenser fans shall be direct driven, propeller type, discharging air vertically upward.
 - b. Fan blades shall be balanced.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- c. Condenser fan discharge openings shall be equipped with PVC coated steel wire safety guards.
 - d. Condenser fan and motor shaft shall be corrosion resistant.
 4. Compressor:
 - a. Compressor shall be of the hermetic scroll type.
 - b. Compressor shall be mounted on rubber grommets.
 - c. Compressor shall include overload protection.
 - d. Compressors shall be equipped with a crankcase heater.
 - e. Compressor shall be equipped with internal high discharge temperature protection.
 5. Coil:
 - a. Coil shall be air-cooled and circuited for sub cooling during cooling mode of operation.
 - b. Coil shall be constructed of aluminum fins (copper fins optional) mechanically bonded to internally grooved seamless copper tubes which are then cleaned, dehydrated, and sealed.
 6. Refrigeration Components and Operation:
 - a. Refrigeration circuit components shall include liquid line service valve, suction line service valve, a full charge of compressor oil, holding charge of refrigerant, and loose shipped refrigerant filter drier (one per circuit).
 - b. Precision-sized suction line accumulator on each refrigerant circuit shall protect from oil being removed from the scroll compressor rotating orbiter and plate during the activation of the defrost mode and switching back and forth from cooling and heating operations.
 - c. Unit shall be capable of starting and running up to 125°F (52°C) and down to 35°F (2°C) ambient outdoor temperature.
 - d. Unit shall operate at ± 10% from rated voltage
 7. Controls and Safeties:
 - a. Minimum control functions shall include:
 - 1) Control wire terminal blocks.
 - 2) Compressor lockout on auto-reset safety until reset from thermostat.
 - 3) Each unit shall utilize the Comfort Alert Diagnostic Board that provides:
 - ⇒ System Pressure Trip fault code indication
 - ⇒ Short Cycling fault code indication
 - ⇒ Locked Rotor fault code indication
 - ⇒ Open Circuit fault code indication
 - ⇒ Reverse Phase 3 fault code indication
 - ⇒ Welded Contactor fault code indication
 - ⇒ Low Voltage fault code indication
 - ⇒ Anti-short cycle protection
 - ⇒ Phase reversal protection
 - b. Minimum safety devices which are equipped with automatic reset (after resetting first at thermostat), shall include:
 - 1) High discharge pressure protection switch.
 - 2) Loss-of-charge protection switch.
 8. Electrical Requirements:
 - a. Unit electrical power shall be single-point connection.
 - b. Unit control circuit shall contain a 75VA - 24-v transformer for unit control.
 9. Special Features:

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- a. Unit-Mounted, Non-Fused Disconnect Switch: (Not available when unit MOCP electrical rating exceeds 80 amps)
 - 1) Switch shall be factory-installed and internally mounted. NEC and UL-approved non-fused switch shall provide unit power shutoff. Switch shall be accessible from outside the unit and shall provide power off lock-out capability.
 - b. Powered Convenience Outlet:
 - 1) Outlet shall be powered from main line power to the rooftop unit.
 - 2) Outlet shall be powered from line side or load side of disconnect by installing contractor, as required by code. If outlet is powered from load side of disconnect, unit electrical ratings shall be UL certified and rated for additional outlet amperage.
 - 3) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
 - 4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 5) Voltage required to operate convenience outlet shall be provided by a factory-installed step-down transformer.
 - 6) Outlet shall be accessible from outside the unit.
 - 7) Outlet shall include a field-installed "Wet in Use" cover.
 - c. Low-Ambient Temperature Control:
 - 1) A low-ambient temperature control shall be provided as a factory-installed option. This low-ambient control shall regulate speed of the condenser-fan motors in response to the saturated condensing temperature of the unit. The control shall maintain correct condensing pressure at outdoor temperatures down to -20°F (-29°C).
10. Outdoor Coil Materials:
- a. Pre-Coated Aluminum-Fin Coils:
 - 1) Coils shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.
11. Thermostat Controls:
- a. Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display, remote sensor capability, and Title 24 compliance.
12. Louvered Hail Guard Package:
- a. Louvered hail guard package shall protect coils against damage from hail and other flying debris.
- 13.

2.05 FILTERS

- A. Construction:
 - 1. Filter sections shall be fabricated as part of the air-handling unit.
 - 2. Filters shall be arranged for upstream, downstream, or side loading as shown on the drawings.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

2.06 UNIT TESTING AND QUALITY CONTROL

- A. All fans which have complete motor controls to include overloads and circuit protection shall be factory run tested to insure proper fan RPM and operation. Testing the fans does not require load, static pressure, air velocity or performance testing. Testing the load, static pressure, air velocity or performance testing is optional and must be listed in the submittal. All electrical circuits shall be tested for correct operation and wiring integrity. Units shall pass quality control checks and must be thoroughly cleaned prior to shipment.

2.07 START-UP SERVICE

- A. Factory start-up assistance is available at an additional cost to be defined based on the jobsite location and number of units. Purchaser's Contractor is responsible for installation and start-up and the Seller will only provide onsite training and assistance for the contractor.
- B. Extended warranty of components may require installation by factory-certified technicians who are certified by the component manufacturer.

2.08 ENVIRONMENTAL REQUIREMENTS

- A. Contractor: Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings are lubricated, and fan has been test run under observation.
- B. Contractor: Do not store or use any hazardous materials or chemical on or in the unit.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install units' level and plumb.
- B. Install with stainless steel drain pan with condensate drain to suitable discharge point.
- C. Install with flexible duct connections.
- D. Provide clearance for filter removal.
- E. Provide with vibration isolation.
- F. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- G. Install roof-mounted, compressor-condenser components on existing equipment support curbs/dunnage. Contractor to provide new or modify existing dunnage as required.
- H. Coordinate the electrical requirements of the unit with the electrical contractor prior to ordering or installing the equipment.
- I. Furnish and install all controls and control wiring. Wiring shall be in accordance with the NEC. Control wiring above the roof shall be in galvanized steel conduit with watertight fittings.
- J. Installations shall be in accordance with the instructions of the manufacturer and meet all requirements.
- K. Protect and be responsible for equipment until accepted in place by the owner.
- L. Provide condensate drain and discharge to a suitable discharge point which shall be acceptable to the owner and A/E.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- M. Contractor shall interlock the air handling unit controls with the remote condensing unit. Contractor is to furnish and install an air proving switch or current sensor at the air handler's blower and be interlocked with the associated condensing unit controls to shut down if power to the blower is disconnected.
- N. All filters shall be new at time of acceptance by the owner.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.
- E. Any equipment marks, blemishes, scratches, abrasions, or other surface imperfections shall be sanded, primed, and refinished to match adjacent surfaces.
- F. No equipment will be accepted by the owner which has rust, corrosion, or otherwise in progress.
- G. Equipment shall not be used for temporary heat unless separately negotiated with the owner.
- H. All bare ferrous metal shall be painted prior to acceptance.

END OF SECTION

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

PRE-PURCHASE SPECIFICATIONS VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 SCOPE

- A. The purpose of this specification is to pre-purchase the variable frequency drives associated with the Air Handling Units. The rigging of the equipment and accessories to their final location, installations, connections, and power and controls, will be provided by the installing contractor.
- B. In addition to furnishing the air handling units, the vendor shall list separate pricing for the following items.
 - 1. Shipping and handling costs FOB site.
 - 2. VFD inspection
 - 3. Inspection and adjustment
 - 4. Start-up service and Owner training
 - 5. Field performance verification

1.02 OWNER AND LOCATION

- A. The term Owner refers to Rowan University, 201 Mullica Hill Road, Glassboro, NJ 08028
- B. The term Site refers to the Campbell Library, Rowan University, 201 Mullica Hill Road, Glassboro, NJ 08028

1.03 ACCEPTANCE OR REJECTION OF PROPOSALS

- A. The Owner, in its sole discretion, may waive any informality in any proposal, may accept any proposal or may reject any or all proposals. The Owner shall announce the successful manufacturer within seven (7) days after opening of proposals, but such announcement shall not be construed as a rejection of any other proposal. The accepted manufacturer shall promptly execute the Contract and all related documents, which shall be prepared by the Owner. Upon failure of the accepted manufacturer to execute such documents within four (4) business days after they have been presented for execution, such manufacturer shall be disqualified.

1.04 ASSIGNMENT OF CONTRACT AND PAYMENT

- A. The Owner reserves the right to assign this Contract to the installing contractor for coordination and administration. In no event shall the responsibility of the manufacturer, toward the Owner, as specified, be abrogated. The manufacturer shall agree to terms and conditions in the Owner's, purchase order agreement and conditions specified herein.
- B. The manufacturer shall invoice for payment at time of shipping and Owner shall issue payment up to 90% of invoiced amount. The remaining 10% of the invoice shall be retained until acceptance by Owner.

1.05 CODES, RULES, PERMITS AND FEES

- A. Nothing contained in this specification shall be so construed as to conflict with the standards of the

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

National Fire Protection Association, International Code Council, Buildings, Mechanical, Electrical, and Energy Codes, or any local, municipal, State or Federal regulation governing the installation of the equipment specified herein, and the requirements of same. All such laws, ordinances and regulations, where they apply to this work, are hereby incorporated into and made a part of this Specification. Where applicable, materials and equipment shall bear stamps or seals of UL, IEEE, NEMA, ANSI, ASME, and other industry regulating groups. In case of difference between governing codes, specifications, laws, ordinances, industry and utility regulations, or contract documents, the most stringent shall govern. The manufacturer shall promptly notify the Owner, in writing, of such differences.

1.06 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new, shall bear manufacturer's name and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended.
- B. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage.
- C. No change in character or make of the material specified herein will be permitted at any time after the proposals are received. Manufacturers wishing changes must make written application to the Owner at least four (4) days prior to the time of closing of bids, and if such changes are approved by the Owner, each manufacturer who is involved will be so notified.

1.07 PROPOSAL REQUIREMENTS

- A. The Proposal to the Owner shall include preliminary drawings and performance data, sufficient to demonstrate that the physical sizes and unit performance capacities can be met. Dimensions and performance requirements are indicated on Drawing M603 in the Construction Contract Documents.
- B. Failure to provide dimensional drawings or unit sizes and configurations that vary from design requirements may result in disqualification of the bid as installation space is limited.

1.08 QUALITY ASSURANCE

- A. The design indicated on the schedules and shown on the drawings is based upon the products of the named manufacturer. Alternate equipment manufacturers are acceptable if equipment meets scheduled performance requirements and dimensional requirements.
- B. Referenced Standards and Guidelines:
 - 1. Institute of Electrical and Electronic Engineers (IEEE)
 - a. IEEE 519-2014, IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
 - 2. Underwriters Laboratories (as appropriate)
 - a. UL 508A
 - b. UL 61800-5-1
 - 3. National Electric Code (NEC)
 - a. NEC 430.120, Adjustable-Speed Drive Systems
 - 4. CSA Group
 - a. CSA C22.2 No. 274
 - 5. International Building Code (IBC)
 - a. IBC 2018 Seismic – referencing ASCE 7-16 and ICC AC-156

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

C. Qualifications:

1. Drives shall be UL labeled as a complete assembly. The base VFD shall be UL listed for 100 kA SCCR when installed in accordance with the manufacturer's guidelines.
2. The base drive shall be CE and meet EN 61800-3 for the First Environment restricted distribution (Category C2).
3. The base drive shall be seismically certified per 2018 International Building Code (IBC) with a seismic importance factor of 1.5, and minimum 2.5 SDS rating. Seismic certification of equipment and components shall also be provided by HCAI (formerly OSHPD) preapproval.
4. The base drive shall be SEMI-F47 certified. The drive must tolerate voltage sags to 50% for up to 0.2 seconds, sags to 70% for up to 0.5 seconds, and sags to 80% for up to one second.
5. Acceptable Manufacturers
 - a. ABB ACH Series.
6. Alternate manufacturer's requests shall be submitted in writing to the Engineer for approval at least 20 working days prior to bid. Approval does not relieve the supplier of specification requirements.

1.09 SUBMITTAL DOCUMENTATION REQUIRED

A. Submittals shall include the following:

1. Outline dimensions, conduit entry locations and weights.
2. Electrical diagrams must be drive package specific and generic drawings are not allowed. Hand marked or manually modified diagrams are not acceptable
3. HCAI (formerly OSHPD) preapproval, seismic certification, and installation requirements where applicable.
4. Complete technical product description with complete list of options provided. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification.
5. Building Information Modeling (BIM) objects shall be available online.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish. All fans must be periodically rotated during storage period per manufacturer recommendation.

1.11 WARRANTY

- A. The complete unit shall be covered by a parts warranty issued by the manufacturer covering the first year of operation from the date of start-up or eighteen months from date of shipment, whichever comes first.
- B. The installing contractor shall provide labor warranty during the unit's first year of operation.

1.12 GUARANTEE

- A. Manufacturer shall guarantee all labor and materials for a period of one year for operation, which shall include agreement to repair, replace in location, and make good at his expense, any and all defects which may appear in his work or materials during that time which, in the judgment of the

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

Owner, arise from defective workmanship or imperfect or inferior materials. The guarantee period shall start after the installation of the equipment is complete and accepted by the Owner.

PART 2 - PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES

- A. The drive package as specified herein and defined on the drive schedule shall be enclosed in a UL Type enclosure.
- B. The drive shall provide full rated output from a line of +10% to -15% of nominal voltage across an ambient temperature range of -15 to 40° C (5 to 104° F).
- C. All drives shall utilize the same Advanced Control Panel (keypad) user interface.
 - 1. Plain English text
 - a. The display shall be in complete English words for programming and fault diagnostics.
 - b. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch or vibration trip. Customized terms, such as: AHU-1 End Switch or CT-2 Vibration shall also be available.
 - 2. The control panel shall include at minimum the followings controls:
 - a. Four navigation keys (Up, Down, Left, Right) and two soft keys.
 - b. Hand-Off-Auto selection, Fault Reset, and manual speed control.
 - c. A Help key shall include assistance for programming and troubleshooting.
 - 3. There shall be a built-in time clock in the control panel with 10-year battery backup.
 - 4. I/O Summary display with a single screen shall indicate and provide:
 - a. The status/values of all analog inputs, analog outputs, digital inputs, and relay outputs.
 - b. The function of all analog inputs, analog outputs, digital inputs, and relay outputs.
 - c. The ability to force all inputs and outputs to either a high, low, or specific value.
 - 5. The drive shall automatically backup parameters to the control panel. The drive shall allow two additional unique manual backup parameter sets to be stored.
 - 6. The control panel shall be removable, capable of remote mounting.
 - 7. The drive shall be able to support a Bluetooth Advanced Control Panel. The Bluetooth control panel shall be FCC and QDL (Qualified Design Listing) certified.
 - a. A free app (iOS and Android) shall replicate the control panel on a mobile device or tablet. The control panel's programming and control functionality shall function on the device. Customizing text, such as AHU-1 End Switch, shall be supported by the device's keyboard.
 - b. Bluetooth connectivity shall allow uploading, downloading, and emailing of parameters.
 - c. Bluetooth connectivity shall include two pairing modes: Always discoverable with a fixed passcode, and manual discovery with a unique generated passcode every pairing.
- D. All drives shall have the following hardware features/characteristics as standard:
 - 1. Two (2) programmable analog inputs, two (2) programmable analog outputs, six (6) programmable digital inputs, and three (3) programmable Form-C relay outputs.
 - 2. The drive shall include an isolated USB port for interface between the drive and a laptop.

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

3. An auxiliary power supply rated at 24 VDC, 250 mA shall be included.
 4. At a minimum, the drives shall have internal impedance equivalent to 5% to reduce the harmonics to the power line. 5% impedance may be from dual (positive and negative DC link) chokes, or AC line reactor. Drives with only one DC link choke shall add an AC line choke integral to the drive enclosure. Reference the drive schedule to determine if additional harmonic mitigation is required for the system to comply with IEEE 519-2014.
 5. The drive shall have variable speed primary cooling fans.
 6. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 135% overload for 2 seconds every minute.
 7. The input current rating of the drive shall not be greater than the output current rating.
 8. Circuit boards shall be coated per IEC 60721-3-3; Chemical gasses Class 3C2 and Solid particles Class 3S2.
 9. Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply with UL 1449 4th Edition.
 10. The drive shall include a robust DC bus to provide short term power-loss ride through. An inertia-based ride through function should help maintain the DC bus voltage during power loss events. Drives with control power ride through only, are not acceptable.
- E. All drives shall have the following software features as standard:
1. A Fault Logger that stores the last 16 faults in non-volatile memory. The most recent 5 faults save at least 9 data points, including but not limited to: Time/date, frequency, DC bus voltage, motor current, DI status, temperature, and status words.
 2. An Event Logger that stores the last 16 warnings or events that occurred, in non-volatile memory. Events shall include, but not limited to: Warning messages, checksum mismatch, run permissive open, start interlock open, automatic reset of a fault, power applied, auto start command, auto stop command, modulating started, and modulating stopped.
 3. Programmable start method. Start method shall be selectable based on the application and function even if the motor was freewheeling in the reverse direction: Flying-start, Normal-start, and Brake-on-start.
 4. Programmable loss-of-load (broken belt / coupling) indication. This function to include a programmable time delay to eliminate false loss-of-load indications.
 5. Motor heating function to prevent condensation build up in the motor. Motor heating adjustment, via parameter, shall be in "Watts."
 6. There shall be a run permissive circuit for damper or valve control.
 7. Four separate start interlock (safety) inputs shall be provided. The control panel will display the specific safety(s) that are open.
 8. The drive shall include a switching frequency control circuit that reduces the switching frequency based on actual drive temperature. It shall be possible to set a minimum and a target switching frequency.
 9. The ability to automatically restart after non-critical faults.
 10. PID functionality shall be included in the drive.
 11. Drive shall be compatible with an accessory that allows the control board to be powered from an external 24 VDC/VAC source.
 12. A computer-based software tool shall be available to allow a laptop to program the drive. The drive shall be able to support programming without the need for line voltage. All necessary power shall be sourced via the laptop USB port.
 13. The drive shall include a fireman's override mode.
- F. Security Features

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

1. The drive manufacture shall clearly define cybersecurity capabilities for their products.
 2. The drive shall include passcode protection against parameter changes. There shall be multiple levels of passcode protection including: End User, Service, Advanced, and Override.
 3. A checksum feature shall be used to notify the owner of unauthorized parameter changes made to the drive.
 4. The “Hand” and “Off” control panel buttons shall have the option to be individually disabled (via parameter) for drives mounted in public areas.
- G. Network Communications
1. The drive shall have an EIA-485 port with removable terminal blocks. The onboard protocols shall be BACnet MS/TP, Modbus, and Johnson Controls N2. Optional communication cards for BACnet/IP and LonWorks shall be available.
 2. The drive shall have the ability to communicate via two protocols at the same time, one onboard protocol and one option card based protocol.
 3. The drive shall not require a power cycle after communication parameters have been updated.
 4. The embedded BACnet connection shall be a MS/TP interface. The drive shall be BTL Listed to Revision 14 or later.
- H. Disconnect – A circuit breaker or disconnect switch shall be provided when indicated on the drive schedule. The disconnect shall be door interlocked and padlockable. Drive input fusing shall be included on all packaged units that include a disconnecting means. All disconnect configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508A label.
- I. Bypass – Bypass drive packages shall be provided when indicated on the drive schedule. All drive/bypass configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508A label.
1. The drive and bypass package shall be a complete factory wired and tested bypass system consisting of a padlockable disconnect device, drive output contactor, bypass contactor, and drive input fuses.
 2. The bypass control shall be powered by a three-phase switch mode power supply with a voltage tolerance of +30%, -35%. Single-phase power supplies and control power transformers (CPT) are not acceptable.
 3. The drive and bypass package shall be seismic certified and labeled to the IBC with a seismic importance factor of 1.5. Seismic certification shall include HCAI (formerly OSHPD) preapproval.
 4. All bypass packages shall utilize a LCD bypass control panel (keypad) user interface. The bypass control panel must be a separate display from the drive control panel.
 5. All bypasses shall have the following hardware features/characteristics as standard:
 - a. Six (6) digital inputs and five (5) Form-C relay outputs.
 - b. Drive isolation fuses shall be provided. Bypass designs which have no such fuses, or that only incorporate fuses common to both the drive and the bypass are not acceptable.
 - c. The bypass shall be able to detect a single-phase input power condition while running in bypass, disengage the motor, and provide a single-phase input power indication.
 - d. The bypass shall be designed for stand-alone operation and be completely functional in both Hand and Automatic modes, even if the drive and/or drive’s control board has failed.
 6. All bypasses shall have the following software features as standard:

CAMPBELL LIBRARY RENOVATIONS

Rowan University – Campbell Library

McHugh Engineering Associates, Inc.
Project No. 2021-331

- a. Programmable loss-of-load (broken belt / coupling) indication shall be functional in drive and bypass mode.
 - b. Run permissive and start interlock control functionality shall be functional in bypass mode.
 - c. The bypass control shall monitor the status of the drive and bypass contactors and indicate when there is a welded contactor contact or open contactor coil.
 - d. The bypass shall include a selection for either manual or automatic transfer to bypass.
 - e. The drive and bypass shall be designed to operate as an integrated system when in Override mode. There shall be four selectable Override modes: Bypass only, drive only, drive then transfer-to-bypass upon fault, and force to stop.
7. Network communications – the bypass shall include BACnet MS/TP, Modbus, and Johnson Controls N2 as standard. Optional communication cards for BACnet/IP and LonWorks shall be available.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The responsible party shall install the drive in accordance with the drive's installation manual.
- B. Installation shall be in accordance with national, state and local building and electrical codes.

3.02 START-UP

- A. Start-up shall be provided for each drive by an authorized local service provider.

3.03 PRODUCT SUPPORT

- A. Factory trained support personnel shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line connected to factory support personnel located in the US and Canada shall be available.
- B. Training shall include installation, programming and operation of the drive, bypass and network communications. Owner training shall be provided locally upon request.

3.04 WARRANTY

- A. The drive Product Warranty shall be 30 months from the date of shipment from the factory. The warranty shall include: Parts, on-site labor, and travel time and travel costs, or replacement of the complete drive as determined by the drive manufacturer's technical support.

END OF SECTION

AREAWAY
FOR (E) EF-4

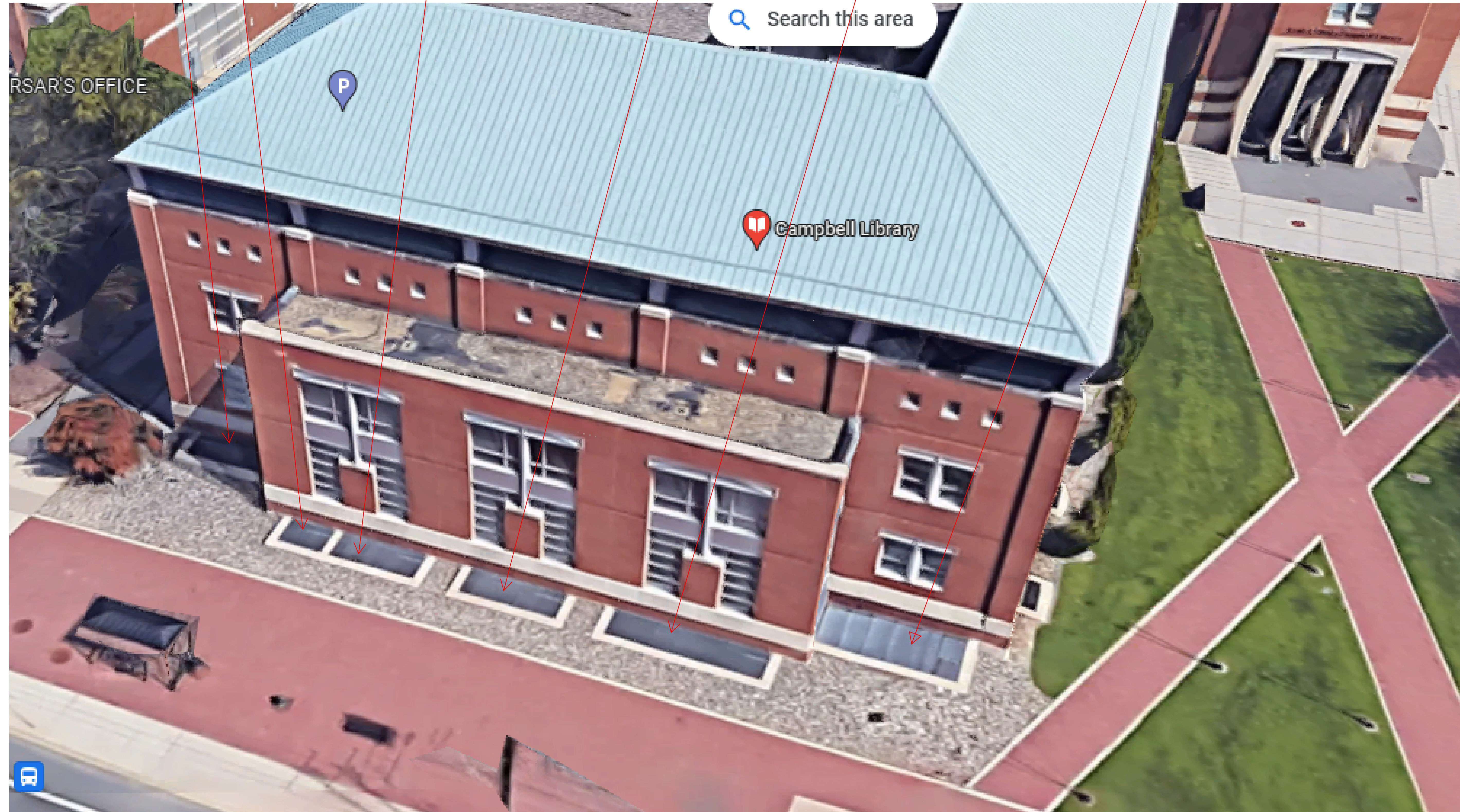
AREAWAY
FOR RF-1

AREAWAY
FOR AHU-1

AREAWAY
FOR AHU-3

AREAWAY FOR
RF-2 AND RF-3

AREAWAY
FOR AHU-2



RSAR'S OFFICE

Search this area

Campbell Library

BR

