

**SECTION 23 81 00
DECENTRALIZED HVAC EQUIPMENT**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The other Contract Documents complement the requirements of this section. The General requirements apply to the work in this section.

1.2 SUMMARY

- A. The Contractor shall provide all necessary labor, materials, equipment, appliances, services and transportation, and perform operations in connection with the construction and installation of the work.
 - 1. Work to be as herein specified and as denoted on the accompanying drawings.
- B. This section of the work includes the providing of the roof curb mounted, weather tight, penthouse type, air conditioning units of the size, capacity, and configuration as denoted, and schedule on the drawings.
- C. Ship the units, completely factory assembled, tested, piped, and internally wired, as one piece fully charged with refrigerant and compressor oil.
- D. The Contractor shall provide a structurally sound, weather tight, level roof curb with nailer and seal as detailed on the drawings.

1.3 SUBMITTALS

- A. Manufacturer shall prepare schedule for approval, listing, and identifying the rooftop unit numbers, noting size, capacity, and other requirements.

1.4 QUALITY ASSURANCE

- A. Provide certified data of their handling performance for assurance of rating accuracy.
 - 1. Coils shall be AHRI certified, Standard 340/360.
- B. Unit wiring shall be in accordance with the latest edition of the National Electric Code.
- C. Equipment and components other than that specified shall meet and exceed the requirements and quality of the items herein specified and as scheduled on the drawings.

1.5 WARRANTY

- A. Provide 5-year parts and labor warranty to include all motors, fans, bearings, coils, controls, electrical devices and related system components, see section 23 05 13.

1.6 COMMISSIONING

- B. Commissioning of a system or systems specified in this section is part of the construction process.
- C. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
- D. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.
- E. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.
- F. Refer to Section 01 91 00, Commissioning, for detailed commissioning requirements.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. This specification is based on products as manufactured by Trane, acceptable equivalent products manufactured by:
 - 1. Carrier
 - 2. York
 - 3. Daikin

2.2 UNIT CASING

- A. Exterior surfaces of unit shall be phosphatized, zinc-coated steel (1.25 oz. per square foot minimum), with baked enamel finish.
 - 1. Provide screws coated with zinc-plus-zinc chromate and with neoprene washers where sealing is required.
- B. Hinged access doors shall provide access to control components, filters, outside/return air dampers, evaporator coil, and supply and exhaust fan sections.
 - 1. Access doors and removable panels shall be double wall construction with 2 lb density insulation sandwiched between galvanized steel panels and complete with neoprene gaskets.
- C. Roof assembly shall have modified lock seam joints filled with sealant.
- D. Provide drains on each side of the evaporator section.
- E. Unit base shall be a one-piece welded assembly with 14-gauge formed, load bearing members, having a formed recess with factory-installed base to roof curb sealing gasket, and shall overhang to facilitate water runoff.
- F. Interior surfaces and exterior casing members shall have ½", 1 lb density foil-faced insulation liner.
- G. Unit lifting lugs shall accept chains or cables for rigging and shall serve as unit tie-down points.
 - 1. Tie-down points must not conflict with air openings in down-flow or horizontal discharge units.

2.3 ELECTRICAL CONTROL PANEL

- A. Install and test wiring in individual component assemblies, then recheck during final factory run test.
- B. Main control panel shall have oil safety controls; supply and exhaust fan overload protectors; fuses for supply, exhaust air, and condenser fans; compressor fuses and dead front panel.
- C. Factory wiring shall be complete to load side.
- D. Electrical control identification shall be stenciled in control panels and wiring numbered for identification.
- E. Provide factory wired 15-amp GFI weatherproof service receptacle.

2.4 REFRIGERATOR SYSTEM

- A. Refrigeration
 - 1. Refrigeration controls shall operate condenser fan and evaporator fan, and shall include compressor contactors, and a 24-volt transformer.
 - 2. Each circuit of the unit shall have a separate set of refrigeration controls.
 - 3. Compressor safety controls shall be as outlined in this specification and as required.
- B. Compressors
 - 1. Compressor shall be scroll design installed without suction and discharge valve.
 - 2. Provide completely enclosed compression chamber, allowing refrigerant liquid to pass through without damage to the compressor.
 - 3. Each compressor shall include a direct drive, 3600-rpm, suction gas-cooled hermetic motor, centrifugal oil pump, oil-level sight glass, and oil charging valve.
 - 4. Motors shall have a protective temperature sensor located directly on motor windings.
 - 5. Compressor safety controls shall include high and low pressure cutouts and reset relay.
 - 6. Provide a reset relay that protects compressor against cycling by automatically locking out system operation, when interrupted by high-pressure cutout.
 - 7. Provide a relay requiring manual reset from within the building.
- C. Evaporator Coil
 - 1. Each coil shall be constructed with seamless copper tubing of ½" OD mechanically bonded to heavy-duty aluminum fins and shall be factory pressure and leak tested at 300 psi.

2. Expansion valves shall be included.
- D. Condenser Coil
 1. The primary surface shall be a $\frac{3}{8}$ " OD seamless tube
 2. Secondary surface shall be mechanically bonded heavy configured aluminum fins.
 3. Sub-cooling circuits shall be an integral part of condenser coils.
 4. Coil shall be factory pressure and leak tested at 450 psi and completed dehydrated under vacuum.
- E. Condenser Fans and Motors
 1. Unit shall have balanced direct-drive fans mounted in full length, bell-mouth orifices.
 2. Fan motors shall be permanently lubricated ball bearings and built-in thermal overload protection.
 3. Motors shall be line voltage, and shall be equipped with rain shields to eliminate moisture.
- F. Low Ambient Operation: Standard refrigeration system shall operate to 35°F ambient.
- 2.5 AIR HANDLING SYSTEM
 - A. Indoor air fan unit shall have two, double-inlet, forward-curved, centrifugal-type fans mounted on a common shaft.
 1. Statically and dynamically, balance and test the fans at the factory.
 2. Supply fan shall test run in the unit as part of unit run test.
 3. Mount the fan shaft on two, grease-lubricated ball bearings designed for 200,000 hours average life.
 - B. Mount the fan motor and fan assembly on common base to eliminate belt slippage at startup and to reduce unit vibration.
 - C. Drives shall be adjustable, with OSHA guard.
 1. If belt drives are used, sheaves shall be cast iron, heavy-duty type.
 2. The v-belt shall be static free and sized for 150% of BHP.
 3. Motor bases shall be adjustable.
 - D. All motors shall be high-efficiency type.
- 2.6 FILTERS
 - A. Two-inch, high efficiency media filters shall fit in slide-in racks for ease of change-out and provide 35% efficiency by NBS dust spot test.
- 2.7 OUTSIDE AIR
 - A. Provide and install standard low leak dampers with 1.5% leakage rate at $\frac{1}{2}$ " WG.
 - B. Damper performance shall meet requirements of AMCA Test Standard 575.
 - C. Automatically control the outside air damper for the outside quantities stipulated on the drawings.
 - D. If applicable, for economizer control provide required dampers, and damper actuators.
- 2.8 ROOF CURB
 - A. Curb shall mate with rooftop units to provide support and complete weather tight installation when properly installed.
 1. Curb shall be constructed of stainless steel with wood nailer strip and supply/return opening with gasket shall be provided.
 2. Curb shall ship knocked down for field assembly.
 3. Provide curbs approved by National Roofing Contractors Association.
- 2.9 CENTRAL CONTROL PANEL
 - A. Panel shall include system operation switches and signal lights for central station control and monitoring.
 1. Signal lights shall indicate fan operation, heating malfunction, cooling malfunction, and dirty filters.

- B. Index the rooftop unit "ON" from microprocessor based time controller specified in Section 23 09 00, "CONTROLS AND INSTRUMENTATION."

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install per manufacturer and code requirements.
- B. The Contractor shall provide and install a structurally sound, weather tight, level roof curb with nailer and seal.
- C. The unit manufacturer shall provide spring-type vibration isolation sized to match the specific unit and be suitable for installation by the Contractor.

3.2 CHECK-TEST-START PROCEDURES

- A. The Contractor shall provide labor to accomplish the check, test, and start procedure as recommended by unit manufacturer.
- B. At time of check-test-start, Contractor shall leak test the factory pre-charged system.
 - 1. If necessary the Contractor shall evacuate, and charge units in accordance with equipment manufacturer's instructions.
 - 2. The Contractor shall supply refrigerant.
- C. The unit manufacturer shall provide the manufacturer's check, test, and start forms.
 - 1. Send one copy to the Engineer and one copy to the installation contractor.
- D. Contractors' startup shall be scheduled and documented in accordance with the commissioning requirements.
 - 1. Refer to Section 01 91 00, Commissioning, for further details

3.3 When the work is completed and at a time directed by the Owner or A/E, the Contractor shall carefully adjust parts of the equipment and systems.

- A. This includes adjustment of automatic controls and safety devices, proper setting of adjustable devices, dampers and valves, and other necessary operations so the systems are fully operable and automatic in operation.
- B. Upon completion of this work, notify the Owner and A/E that system is ready for final tests and inspection.
- C. At the time of final inspection, a person of authority shall represent this Contractor.
 - 1. He shall demonstrate, as directed by the A/E, that his work fully complies with the purpose and intent of the specifications and drawings.
 - 2. The Contractor shall provide Labor, services, instruments, and tools necessary for demonstrations and tests.
 - 3. Moving parts of apparatus shall be lubricated and adjusted.
- D. The Contractor shall test and adjust each instrument specialty and equipment furnished by him prior to final acceptance.
 - 1. The Contractor shall demonstrate that subsystems operate as a coordinated and properly functioning integrated system to the approval of the A/E.
- E. The Contractor shall furnish labor; provide adjustments, and incidentals necessary to obtain the desired and intended results.

3.4 FUNCTIONAL PERFORMANCE TESTING

- A. System Functional Performance Testing is part of the Commissioning Process.
 - 1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority witness and document the test.
 - 2. Refer to Section 01 91 00, Commissioning, for functional performance tests and commissioning requirements.

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

- B. Systems Readiness Checklists shall be completed and submitted for each piece of equipment included in this section.

3.5 DEMONSTRATION AND TRAINING

- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
 - 1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
 - 2. Coordinate the instruction in with the Owner's Representative after submission and approval of formal training plans.
 - 3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements
- B. Provide demonstration and training for all equipment covered by this section and installed in this project.

END OF SECTION