

SECTION 23 84 00
HUMIDITY CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies preconditioning of existing or new air conditioning systems.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS: Requirements for pre-test of equipment.
- B. Section 23 05 11, COMMON WORK RESULTS FOR HVAC: General mechanical requirements and items, which are common to more than one section of Division 23.
- C. Section 23 21 13, HYDRONIC PIPING: Requirements for field hot water piping.
- D. Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING: Requirements for field steam and condensate piping.
- E. Section 23 82 16, AIR COILS: Requirements for run-around system coils.
- F. Section 23 31 00, HVAC DUCTS AND CASINGS: Requirements for sheet metal ducts and fittings.
- G. Section 23 40 00, HVAC AIR CLEANING DEVICES: Requirements for filters including efficiency.
- H. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Requirements for controls and instrumentation.
- I. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC: Requirements for testing, adjusting and balancing of HVAC system.
- J. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT: Requirements for HVAC motors.
- K. Section 26 29 11, MOTOR CONTROLLERS: Requirements for motor starters.
- L. Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS: Requirements for commissioning, systems readiness checklists, and training.
- O. 01 91 00, GENERAL COMMISSIONING REQUIREMENTS

1.3 QUALITY ASSURANCE

- A. Refer to the GENERAL CONDITIONS.
- B. Refer to specification Section 01 00 00, GENERAL REQUIREMENTS for performance tests and instructions to VA personnel.
- C. Refer to paragraph, QUALITY ASSURANCE, in specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

- D. Unit(s) shall be provided by a manufacturer who has been manufacturing desiccant dehumidifiers and have been in satisfactory service for at least three (3) years.

1.4 SUBMITTALS

- A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Manufacturer's Literature and Data:
1. Technical data on design operating inlet and outlet conditions, air flows with diagram showing air volumes and conditions throughout the system, dehumidification capacity, filtration and fan motor and electrical power data.
 2. A general arrangement diagram with overall dimensions showing all major components with overall dimensions, utility and duct work connections, bolting arrangement, operating weight and required service and equipment removal clearances.
 3. Control diagrams for preconditioning of existing and / or new air conditioning system.
- C. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.
- D. Submit fan curves with specified operating point clearly plotted and sound power levels for both fan outlet and casing radiation at rated capacity.
- E. Submit unit control system documentation required for interface with BACnet protocol DDC control system. Submit BACnet compliant Protocol Implementation Conformance Statement (PICS) for all controllers.
- F. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- G. Certificate: Evidence of satisfactory performance on three similar installations.
- H. Provide installation, operating and maintenance instructions, in accordance with Article, INSTRUCTIONS, in specification Section 01 00 00, GENERAL REQUIREMENTS.
- I. Performance test report: In accordance with PART 3.
- J. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in

accordance with the requirements of Section 23 08 00,
COMMISSIONING OF HVAC SYSTEMS.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Air-conditioning, Heating and Refrigeration Institute (AHRI)
410-01.....Forced-Circulation Air-Cooling and Air-Heating Coils
- C. Air Movement and Control Association (AMCA):
99-10.....Standards Handbook
210-07.....Laboratory Methods of Testing Fans for Aerodynamic Performance Rating (ANSI)
301-06.....Laboratory Methods of Testing Fans for Aerodynamic Performance Rating (ANSI)
- D. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
52.2-07.....METHOD OF TESTING General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size (ANSI)
62.1-10.....Ventilation for Acceptable Indoor Air Quality (ANSI)
- E. American Bearing Manufacturers Association (ABMA)
9-1990 (R2008).....Load Ratings and Fatigue Life for Ball Bearings (ANSI)
- F. National Fire Protection Association (NFPA)
90A-09.....Standard for the Installation of Air-Conditioning and Ventilating Systems
70-0511.....National Electrical Code

1.6 QUALITY ASSURANCE

- A. Fan Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301; tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.
- D. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with AHRI 410.
- E. Product of manufacturer regularly engaged in production of pool dehumidification equipment who issues complete catalog data on total product.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.
- B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish.
- C. Comply with manufacturer's rigging and installation instructions.

1.8 PROJECT CONDITIONS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, fan has been test run, all piping is connected and energized and all wiring complete and tested.

1.9 ADDITIONAL REQUIREMENTS

- A. Provide one additional set of fan belts and disposable panel filters for each unit.

B. CORROSION PROTECTION

For air-handling unit mounted coils provide the following corrosion treatment:

- 1. Epoxy Immersion Coating - Electrically Deposited: The multi-stage corrosion-resistant coating application comprises of cleaning (heated alkaline immersion bath) and reverse-osmosis immersion rinse prior to the start of the coating process. The coating thickness shall be maintained between 0.6-mil and 1.2-mil. Before the coils are subjected to high-temperature oven cure, they are treated to permeate immersion rinse and spray. Where the coils are subject to UV exposure, UV protection spray treatment comprising of UV-resistant urethane mastic topcoat shall be applied. Provide complete coating process traceability for each coil and minimum five years of limited warranty.
- 2. The coating process shall such that uniform coating thickness is maintained at the fin edges. The quality control shall be maintained by ensuring compliance to the applicable ASTM Standards for the following:
 - a. Salt Spray Resistance (Minimum 6,000 Hours)
 - b. Humidity Resistance (Minimum 1,000 Hours)
 - c. Water Immersion (Minimum 260 Hours)
 - d. Cross-Hatch Adhesion (Minimum 4B-5B Rating)
 - e. Impact Resistance (Up to 160 Inch/Pound)

3. Casing Surfaces (Exterior and Interior): All exposed and accessible exterior and interior metal surfaces shall be protected with a water-reducible acrylic with stainless steel pigment spray-applied over the manufacturer's standard finish. The spray coating thickness shall be 2-4 mils and provide minimum salt-spray resistance of 1,000 hours (ASTM B117) and 500 hours UV resistance (ASTM D4587).

PART 2 - PRODUCTS

2.1 HUMIDIFIER UNITS

- A. General: Units shall be complete, factory assembled, and tested; and of sizes, arrangements, capacities, and performance as scheduled and as specified in the schedules shown in the drawings; and for outdoor installation preconditioning of existing and new air conditioning system.
 2. Unit(s) shall be capable and designed for year-round, 24-hours-a-day operation; and requiring only connections of ducts, utilities, and remote sensors, controllers, and monitors.
 3. Unit(s) shall include active regeneration system for control of dehumidification processes.
- B. Casing:
 1. Double-wall construction with corrosion-protective hinged access doors with neoprene gaskets, minimum 50-mm (2-inch) , thick thermal insulation fill, stainless steel fasteners, knockouts for electrical and piping connections through the //side of the unit, condensate drain connection, and lifting lugs.
 2. The unit housing the internal partitions shall be constructed of minimum 18 gage galvanized steel or aluminum pre-insulated double wall panels with a minimum of 50-mm (2-inch) thermal insulation. The base shall be all welded, structural steel or formed 14-gage, galvanized steel. Units shall have cross supports for each major component and base channels and lifting eyes to facilitate rigging. The units shall be of water and air tight construction over all with interior air tight construction between various sections of the units. Adjoining panels shall be sealed with a silicon compound or heavy duty compression type gaskets. Leakage rate shall not exceed 2 percent at a pressure of 746 Pa (3.0 inches water gage).
 3. All non-pre-insulated exterior panels shall be insulated with minimum 25-mm (1-inch) vinyl- or foil-faced fiberglass

- insulation without exposed edges, and secured by permanent mechanical fasteners.
4. All exterior panels shall be embossed aluminum cabinet panels constructed with corrosion-protective coating on the manufacturer's standard coating.
 5. All internal air-processing and air-treatment components shall be removable through removable access panels without dismantling plenums or ductwork.
 6. Access panels shall be provided with resilient gaskets and quick-release hardware.
 7. Access doors for filters and control adjustment shall have corrosion-resistant, continuous hinge or heavy-duty, multiple hinges.
 8. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.
- C. Controls and Wiring: Factory-installed microprocessor type to control and monitor unit and communicate to central-control processor, and shall operate dehumidification units and maintain humidity and temperature set points. The controller shall be connected to the building DDC control system via an open protocol BACnet interface.
1. The unit shall have a factory wired and unit mounted central, electrical control panel with a single power supply connection. All internal wiring shall be in accordance with the National Electrical Code. Unit shall have a non-fused main power disconnect and control components required for automatic operation based on signals from space mounted humidity and temperature controls. Control panel shall have terminals for remote control devices.
 2. Controls shall be capable of shutting down the dehumidifier when humidity loads are reduced and the process shall be reversed when there is an increase in humidity loads.
 3. Reactivation energy shall be automatically reduced at lower than design humidity loads.
 4. Carbon dioxide sensor mounted in return air shall operate minimum outdoor-air damper position.
 5. Discharge-air, outdoor-air, conditioned-space, control set-point-temperature, and outdoor-air enthalpy shall be displayed with a LCD in control panel.

6. Filter pressure drop and alarm shall be displayed by an LCD in control panel.
 7. Airflow, fans, system, unit operation, and operating mode status shall be displayed in control panel.
- D. Post Cooling Coil Section: Comply with requirements in Section 23 82 16, AIR COILS.
- E. Safety Devices:
1. Low-Pressure Cutout: Manual reset after three auto-reset failures.
 2. High-Pressure Cutout: Manual reset.
 3. Compressor Motor Overload Protection: Manual reset.
 4. Antirecycling Timing Device: Prevent compressor restart for five minutes after shutdown.
 5. Adjustable, Low-Ambient, Head-Pressure Control: Designed to operate at temperatures as low as 0 deg F (minus 18 deg C) by cycling condenser fans and controlling speed of last fan of each circuit.
 6. Oil-Pressure Switch: Designed to shut down compressors on low oil pressure.
- F. Condenser Fans: Propeller-type fans directly driven by motors with permanently lubricated bearings and internal thermal-overload protection.
- G. Drain Pan and Connection: Stainless steel; insulated and complying with ASHRAE 62.1-2007.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Follow equipment manufacturer's written instructions for handling and installation of equipment.
- B. Adjust seals and purge of rotating wheels as recommended by the manufacturer.
- C. Verify correct settings and installation of controls.
- D. Install vibration-control devices.
 1. Units with Internally Isolated Fans: Secure units to anchor bolts installed in concrete bases.
 2. Floor-Mounted Units: Support on concrete bases using neoprene pads having a minimum static deflection of 6.35 mm (0.25 inch). Secure units to anchor bolts installed in concrete bases.
 3. Suspended Units: Suspend units from structural-steel support frame using threaded steel rods and spring hangers.

- E. Isolation Curb Support: Install units on isolation curbs, and install flexible duct connectors and vibration isolation and seismic-control devices. Flexible duct connectors are specified in Section 23 31 00, HVAC DUCTS AND CASINGS. Vibration isolation and seismic-control devices are specified in Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.

3.2 CONNECTIONS

- A. Install piping adjacent to machine to allow service and maintenance.
- B. Connect piping to units mounted on vibration isolators with flexible connectors.
- C. Connect condensate drain pans using minimum DN 32 NPS 1-1/4copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan, and install clean out at changes in direction.
- D. Steam and Condensate Piping: Comply with applicable requirements in Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING. Connect with shutoff valve and union or flange.
- E. Install ducts to termination in roof-mounting frames. Where indicated, terminate return-air duct through roof structure and insulate the space between roof and bottom of unit.
- F. Ground equipment according to Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- G. Connect wiring according to Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW).
- H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 STARTUP SERVICE

- A. Perform the following final checks before startup:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connection to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Perform cleaning and adjusting specified in this Section.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify free fan wheel rotation and smooth

- bearing operations. Reconnect fan drive system, align belts, and install belt guards.
- 5. Verify lubrication of bearings, pulleys, belts, and other moving parts.
- 6. Set outside- and return-air mixing dampers to minimum outdoor-air setting.
- 7. Install clean filters.
- 8. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.
- B. Perform the following starting procedures for dehumidification units:
 - 1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace malfunctioning motors, bearings, and fan wheels.
 - 2. Measure and record motor electrical values for voltage and amperage.
 - 3. Manually operate dampers from fully closed to fully open position and record fan performance.
- C. Complete installation and startup checks according to manufacturer's written instructions.
- D. Startup Report: Report findings during startup. Identify startup steps, corrective measures taken, and final results.
- E. The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Resident Engineer and Commissioning Agent. Provide a minimum of 7 days prior notice.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust initial temperature and humidity set points.

3.5 CLEANING

- A. Clean dehumidification units internally, on completion of installation, according to manufacturer's written instructions. Clean fan interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheels, cabinets, and coils' entering-air face.
- B. After completing system installation, testing, and startup service of dehumidification units, clean filter housings and install new filters.

3.6 INSTRUCTIONS

Provide services of manufacturer's technical representative for eight hours to instruct VA personnel in operation and maintenance of desiccant dehumidifiers.

3.7 COMMISSIONING

- A. Provide commissioning documentation in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS for all inspection, start up, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.
- B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS and related sections for contractor responsibilities for system commissioning.

3.8 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of units.
- B. Submit training plans and instructor qualifications in accordance with the requirements of Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS.

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