

**SECTION 23 81 23**  
**COMPUTER-ROOM AIR-CONDITIONERS**

**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies process cooling split systems air conditioning unit.
- B. Definitions:
  - 1. Energy Efficiency Ratio (EER): A ratio calculated by dividing the cooling capacity in Btuh by the power input in watts at any given set of rating conditions, expressed in Watts (Btu/h) per watt.
  - 2. Coefficient of Performance (COP): A ratio calculated by dividing the change in heating or cooling capacity (Btu/h) to the energy consumed by the system (kW), expressed in Btu/kWh.
  - 3. Unitary (AHRI): Consists of one or more factory-made assemblies, which normally include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function.
  - 4. CRAC Units: Computer Room Air Conditioning Units.

**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 23, HYDRONIC PUMPS and Section 23 22 23, STEAM CONDENSATE PUMPS: Requirements for pumping equipment.
- D. Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT: Requirements for vibration isolators and room noise level.
- E. Section 23 07 11, HVAC, PLUMBING, and BOILER PLANT INSULATION: Requirements and for ducts and piping insulation.
- F. Section 23 23 00, REFRIGERANT PIPING: Requirements for field refrigerant piping.
- G. Section 23 21 13, HYDRONIC PIPING and Section 23 22 13, STEAM and CONDENSATE HEATING PIPING: Requirements for condensate piping and fittings // and steam piping //.
- H. Section 23 31 00, HVAC DUCTS and CASINGS: Requirements for sheet metal ducts and fittings.
- I. Section 23 40 00, HVAC AIR CLEANING DEVICES: Requirements for filters including efficiency.
- J. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Requirements for controls and instrumentation.

- K. Section 23 05 93: TESTING, ADJUSTING, and BALANCING FOR HVAC:  
Requirements for testing, adjusting and balancing of HVAC system.
- L. Section 23 08 00 - COMMISSIONING OF HVAC SYSTEMS: Requirements for commissioning, systems readiness checklists, and training.

**1.3 QUALITY ASSURANCE**

- A. Refer to specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

**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, rated capacities (at design indoor and outdoor conditions), EER/COP, operating characteristics, required specialties and accessories. Submit published catalog selection data showing equipment ratings and compliance with required sensible ratio.
  - 1. Indoor Air Conditioning Unit
  - 2. Air Cooled Condensing Unit
- C. Submit detailed equipment assemblies with dimensions, operating weights, required clearances.
- D. Submit wiring diagrams for power, alarm and controls.
- E. Certification: Submit, simultaneously with shop drawings, a proof of certification:
- F. 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 GUARANTEE**

- A. The unit shall be guaranteed against all mechanical defects in material, parts or workmanship and shall be repaired or replaced at the Contractor's expense within the period of one year from final acceptance. Contractor shall adhere to a four hour service response time to troubles during the guarantee period.

**1.6 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. Federal Specifications (Fed Spec):
  - 00-A-374C-95.....Air-Conditioners with Remote Condensing Units or Remote Air-cooled and Water-Cooled Condenser Units, Unitary
  - TT-C-490D-93.....Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings

- C. Air-Conditioning, Heating and Refrigeration Institute (AHRI) Standards:
  - 210/240-08.....Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment
  - 340/360-07.....Performance Rating of Commercial and Industrial Unitary Air Conditioning and Heat Pump Equipment
  - 410-01.....Forced-Circulation Air-Cooling and Air-Heating Coils
  - 460-2005.....Performance Rating of Remote Mechanical-Draft Air-Cooled Refrigerant Condensers
  - 520-04.....Performance Rating of Positive Displacement Condensing Units
  - AHRI-DCPP.....Directory of Certified Product Performance - Applied Directory of Certified Products
- D. Air Movement and Control Association (AMCA):
  - 210-07.....Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating (ANSI)
  - 410-96.....Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans
- E. American Society of Heating, Refrigerating, and Air-Conditioning Engineers Inc. (ASHRAE):
  - 15-10.....Safety Standard for Refrigeration Systems (ANSI)
  - 90.1-10.....Energy Standard for Buildings except Low-Rise Residential Buildings (ANSI Approved; IESNA Co-sponsored)
  - 2008 Handbook.....HVAC Systems and Equipment
  - 2010 Handbook.....Refrigeration
  - 52.1-92.....Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices used in General Ventilation for Removing Particulate Matter
- F. American Society of Testing and Materials (ASTM):
  - B117-09.....Standard Practice for Operating Salt Spray (Fog) Apparatus
- G. National Electrical Manufacturer's Association (NEMA):
  - MG 1-09 (R2010).....Motors and Generators (ANSI)
- H. National Fire Protection Association (NFPA) Publications:
  - 70-11.....National Electrical Code
  - 90A-09.....Standard for the Installation of Air-Conditioning and Ventilating Systems

**PART 2 - PRODUCTS**

**2.1 CEILING-MOUNTED UNITS**

- A. Description: Self-contained, factory assembled, prewired, and prepiped; consisting of cabinet, fan, filters, and controls; for horizontal ceiling mounting to fit T-bar ceiling opening of 610 by 1220 mm (24 by 48 inches).
- B. Cabinet: Galvanized steel with baked-enamel finish, insulated with 13-mm (1/2-inch) thick duct liner.
- C. Integral factory-supplied supply and return grille to fit ceiling grid kit of 610 by 1220 mm (24 by 48 inches), with filter.
- D. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010.
- E. Supply-Air Fan:
  - 1. Forward-Curved, Centrifugal Fan: Provide with directly-driven fan with two-speed motor.
- F. Compressor: Hermetic scroll, (VA: Type) with oil strainer, internal motor overload protection, resilient suspension system, and crankcase heater.
- G. Refrigeration Circuit: Low-pressure switch, manual-reset high-pressure switch, thermal-expansion valve with external equalizer, sight glass with moisture indicator, service shutoff valves, charging valves, and charge of refrigerant.
- H. Refrigerant: R-407C unless otherwise indicated.
- I. Refrigerant Evaporator Coil: Direct-expansion coil of seamless copper tubes expanded into aluminum fins.
  - 1. Mount coil assembly over stainless-steel drain pan complying with ASHRAE 62.1-2007 and having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir.
- J. Remote Air-Cooled Refrigerant Condenser: Integral, copper-tube aluminum-fin coil with centrifugal fan, direct driven.
- K. Split system shall have suction- and liquid-line compatible fittings and refrigerant piping for field interconnection.
- L. Electric-Resistance Heating Coil: Finned-tube electric elements with contactor, dehumidification relay, and high-temperature-limit switches.
- M. Filter: 25-mm (1 inch) thick, disposable, glass-fiber media.
  - 1. Arrestance: 90 percent according to ASHRAE 52.1.
  - 2. MERV Rating: 7 according to ASHRAE 52.2.
- N. Electrode Steam Humidifier: Self-contained, microprocessor-controlled unit with disposable, polypropylene-plastic cylinders, and having field-adjustable steel electrodes and stainless-steel steam dispersion tube.

- O. Plumbing Components and Valve Bodies: Plastic, linked by flexible rubber hosing, with water fill with air gap and solenoid valve incorporating built-in strainer, pressure-reducing and flow-regulating orifice, and drain with integral air gap.
- P. Control: Fully modulating to provide gradual 0 to 100 percent capacity with field-adjustable maximum capacity; with high-water probe.
- Q. Drain Cycle: Field-adjustable drain duration and drain interval.
- R. Disconnect Switch: Nonautomatic, molded-case circuit breaker with handle accessible when panel is closed and capable of preventing access until switched to off position.
- S. Control System: Unit-mounted panel with main fan contactor, compressor contactor, compressor start capacitor, control transformer with circuit breaker, solid-state temperature- and humidity control modules, time-delay relay, heating contactor, and high-temperature thermostat. Wall-mounted control panel shall be solid-state, with start-stop switch adjustable humidity dirty set point, and adjustable temperature set point.
- T. DDC Interface: Provide connection to DDC system.

**2.2 FAN MOTORS**

- A. Default motor characteristics are specified in Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT.
- B. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT.
- C. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- D. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

**2.3 SPECIAL TOOLS**

- A. If any part of equipment furnished under these specifications requires a special tool for assembly, adjustment, setting, or maintenance and the tool is not readily available from the commercial tool market, furnish the necessary tools with equipment as a standard accessory

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Handle and install refrigeration units and accessories in accordance with the instructions and recommendations of the manufacturer.

- B. Coordinate installation of Computer room Air Conditioning Units with Computer room access flooring installer.
- C. Field Refrigerant Piping: As specified in specification Section 23 23 00, REFRIGERANT PIPING.
- D. Field Piping: Condensate Piping, as specified in specification Section 23 21 13, HYDRONIC PIPING.
- E. Electrical System Connections and Equipment Ground: As specified in Division 26 Sections.

### **3.2 CONNECTIONS**

- A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.
- B. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- C. Install piping adjacent to machine to allow service and maintenance.
- D. Water and Drainage Connections: Comply with applicable requirements in Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING. Provide adequate connections for condensate drain, and humidifier flushing system.
- E. Refrigerant Piping: Comply with applicable requirements in Section 23 23 00, REFRIGERANT PIPING. Provide shutoff valves and piping.

### **3.3 FIELD QUALITY CONTROL**

- A. Tests and Inspections:
  - 1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
  - 2. After installing computer-room air conditioners and after electrical circuitry has been energized, test for compliance with requirements.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. After startup service and performance test, change filters and flush humidifier.

### **3.4 INSTRUCTIONS**

- A. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of computer room air conditioning equipment.

**3.5 STARTUP AND TESTING**

- A. 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.

**3.6 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.

**3.7 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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