

SECTION 238119 - SELF-CONTAINED AIR-CONDITIONERS

TIPS:

To view non-printing **Editor's Notes** that provide guidance for editing, click on Masterworks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on Masterworks/Supporting Information.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes packaged, [air] [water]-cooled air-conditioning units with refrigerant compressors and controls intended for indoor installations.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. LEED Submittals:
 - 1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
 - 2. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- D. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For self-contained air conditioners to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: [One] <Insert number> set(s) of filters for each unit.
 - 2. Fan Belts: [One] <Insert number> set(s) of belts for each unit.
 - 3. Gaskets: [One] <Insert number> set(s) for each access door.
 - 4. Fuses: [One] <Insert number> set(s) for each air-handling unit.

1.7 QUALITY ASSURANCE

- A. 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.
- B. ARI Compliance:
 - 1. Applicable requirements in ARI 210/240.
 - 2. Applicable requirements in ARI 340/360.
 - 3. Applicable requirements in ARI 390.
- C. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
 - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Ventilation Rate Procedures," and Section 7 - "Construction and Startup."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of self-contained air conditioners that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

- a. For Compressor: **[One]** **[Five]** **<Insert number>** year(s) from date of Substantial Completion.
- b. For Parts: **[One]** **[Five]** **<Insert number>** year(s) from date of Substantial Completion.
- c. For Labor: **[One]** **[Five]** **<Insert number>** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.2 PACKAGED UNITS

- A. Description: Factory assembled, wired, and tested; and fully charged with refrigerant and oil.
- B. Configuration: Horizontal, ceiling[-**plenum**] mounted.
- C. Configuration: Vertical, floor mounted; [**vertical**] [**and**] [**horizontal**] discharge.
- D. Configuration: Horizontal, ceiling mounted and vertical, floor mounted; [**vertical**] [**and**] [**horizontal**] discharge.
- E. Disconnect Switch: Factory mounted [**in control panel**] [**on cabinet**].

2.3 Cabinet

- A. Frame and Panels: Structural-steel frame with galvanized-steel panels and access doors or panels.
 1. Exterior-Surface Finish: Factory painted in color selected by Architect.
 2. Interior-Surface Finish: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- B. Insulation: **1-inch-** **(25-mm-)** thick, glass-fiber duct liner complying with ASTM C 1091 and having a microbial coating on cabinet interior and control panel. **1/2-inch-** **(13-mm-)** thick liner is acceptable for units smaller than **15 tons** **(50 kW)**.
- C. Return-Air Opening: Rear, [**open**] [**flange for duct connection**].

- D. Corrosion-Resistant Treatment: Phenolic coating on unit interior and exterior.

2.4 Supply-air Fan

- A. Fan Material: Galvanized steel.
- B. Configuration: Double-width, double-inlet, **[forward-curved]** **[airfoil]** centrifugal fan; statically and dynamically balanced. **[Vertical]** **[Horizontal]** discharge with flexible discharge collar.
- C. Drive: **[Belt, with fan mounted on permanently lubricated bearings]** **[Direct, with fan and motor resiliently mounted]**.
- D. Fan Sheaves: Variable pitch, dynamically balanced, bored to fit shafts, and keyed for initial startup.
- E. Motor Sheave: Variable and adjustable pitch, dynamically balanced, and selected to achieve specified rpm when set at midposition.
- F. Belt Rating: As recommended by manufacturer or a minimum of one and one-half times nameplate rating of motor.
- G. Bearings: Grease lubricated with grease lines extended to exterior of unit **[with L-50 life at 200,000 hours]**.
- H. Variable Air Volume: Variable-frequency motor controller **[with bypass]**.
- I. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Special Motor Features: Premium efficiency, as defined in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 2. **<Insert unique motor characteristics>**.
- J. Isolation: Mount fan and motor on common subbase and mount assembly on spring isolators with minimum static deflection of **[1 inch (25 mm)]** **<Insert dimension>**.
- K. Outdoor-Air-Intake Accessories:
 - 1. Barometric Outdoor-Air Damper: Adjustable-blade damper allowing induction of up to 25 percent outdoor air when evaporator fan is running.
 - 2. Motorized Outdoor-Air Damper: Motorized, two-position blade damper allowing induction of up to 25 percent outdoor air; with spring-return, low-voltage damper motor.
 - 3. Energy-Recovery Ventilator: Assembly of desiccant-coated, heat-recovery wheels and centrifugal exhaust fans to transfer approximately 67 percent of the difference between the sensible and latent heat of outdoor and exhaust air.
 - 4. Air-Side Economizer: Damper assembly allowing induction of up to 100 percent outdoor air to maintain a selected mixed-air temperature; and exhaust damper and spring-return, low-voltage, modulating damper motor with minimum position adjustment.

2.5 REFRIGERATION SYSTEM

- A. Compressor: Scroll type, hermetically sealed, 3600 rpm maximum, and resiliently mounted with positive lubrication and internal motor protection.
- B. Refrigerant Coils (Indoor and Outdoor for Air-Cooled Units): Seamless copper tubes expanded into aluminum fins.
 - 1. Corrosion-Resistant Treatment: Phenolic coating applied with multiple dips and baked.
 - 2. Refrigerant Circuits: A separate circuit for each compressor, with externally equalized thermal-expansion valve[**with adjustable superheat**], filter dryer,[**sight glass, high-pressure relief valve,**] and charging valves.
 - 3. Mount coil assembly over stainless-steel drain pan[**complying with ASHRAE 62.1**] [and] [having a condensate pump unit with integral float switch, pump-motor assembly, and condensate reservoir].
 - 4. Refrigerant: [R-22,]R-407C or R-410A.
 - 5. Expansion valve with replaceable thermostatic element.
 - 6. Refrigerant dryer.
 - 7. High-pressure switch.
 - 8. Low-pressure switch.
 - 9. Thermostat for coil freeze-up protection during low ambient temperature operation or loss of air.
 - 10. Low ambient temperature switch.
 - 11. Brass service valves installed in discharge and liquid lines.
- C. Water-Cooled Condenser:
 - 1. Description: Factory assembled and tested; tube in tube coaxial type with water-regulating valve.
 - 2. Tubing: [Nonferrous] [Copper] [Cupro-nickel] inner tube; [steel with corrosion-resistant coating;]refrigerant and water-side leak tested to 400 psig (2760 kPa) underwater.
- D. Water-Side Economizer Section:
 - 1. Description: Factory assembled and tested; consisting of water coil, modulating valves, controls, piping with cleanouts, and access panels.
 - 2. Water Coil: [Two] [Four] rows, copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm), and [copper] [cast-iron] headers; leak tested to 300 psig (2070 kPa) underwater; and having a two-position control valve.

2.6 Heating Coil

- A. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm); leak tested to 300 psig (2070 kPa) underwater; and having a two-position control valve.
- B. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset

thermal cutout; airflow-proving device; and one-time fuses in terminal box for overcurrent protection.

2.7 CONTROLS

- A. Control equipment and sequence of operation are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."
- B. Control Package: Factory wired, including contactor, high- and low-pressure cutouts, internal-winding thermostat for compressor, control-circuit transformer, and noncycling reset relay.
- C. Time-Delay Relay: Five-minute delay to prevent compressor cycling.
- D. Adjustable Thermostat: **[Unit mounted]** **[Remote]** to control the following:
 - 1. Supply fan.
 - 2. Compressor.
 - 3. Condenser.
 - 4. Hot-water coil valve.
 - 5. Electric heater.
- E. System Selector Switch: **[Heat-off-cool]** **[Off-heat-auto-cool]**.
- F. Fan Control Switch: Auto-on.
- G. Time Clock: Cycle unit on and off.
- H. Microprocessor Control Panel: Controls unit functions as standalone or network operation, including refrigeration and safety controls, with unit-mounted display, and the following:
 - 1. Supply fan.
 - 2. Supply-fan motor speed.
 - 3. Compressors.
 - 4. Air-cooled condenser.
 - 5. Cooling tower pump.
 - 6. Modulating, hot-water coil valve.
 - 7. Multistep, electric heater.
 - 8. Time-of-day control to cycle unit on and off.
 - 9. Night-heat, morning warm-up cycle.
 - 10. Economizer control.
 - 11. Panel-mounted control switch to operate unit in remote or local control mode or to stop or reset.
 - 12. Panel-mounted indication of the following:
 - a. Operating status.
 - b. System diagnostics and safety alarms.
 - c. Supply-air temperature set point.
 - d. Zone heating-temperature set point.
 - e. Supply-air pressure set point.

- f. Economizer minimum position set point.
- g. Supply-air-pressure, high-limit set point.
- h. Monitor constant and variable motor loads.
- i. Monitor variable-frequency drive operation.
- j. Monitor economizer cycle.
- k. Monitor cooling load.
- l. Monitor air distribution static pressure and ventilation air volumes.

2.8 Capacities and Characteristics

A. Cooling Capacity:

- 1. Total: <Insert **Btu/h (kW)**>.
- 2. Sensible: <Insert **Btu/h (kW)**>.
- 3. Seasonal Energy Efficiency Ratio: [10.0] [12.0] [13.0] [14.0] [16.0] <Insert ratio>.
- 4. Energy Efficiency Ratio: [10.0] [12.0] [13.0] [14.0] [16.0] <Insert ratio>.
- 5. Moisture Removal Rate: <Insert **pints/h (L/h)**>.
- 6. Entering-Air Temperature:
 - a. Dry Bulb: <Insert **deg F (deg C)**>.
 - b. Wet Bulb: <Insert **deg F (deg C)**>.
- 7. Leaving-Air Temperature:
 - a. Dry Bulb: <Insert **deg F (deg C)**>.
 - b. Wet Bulb: <Insert **deg F (deg C)**>.

B. Heating Capacity:

- 1. Total: <Insert **Btu/h (kW)**>.
- 2. Air-Temperature Rise: <Insert **deg F (deg C)**>.
- 3. Heat Pump:
 - a. Coefficient of Performance: <Insert value>.
 - b. Heating Season Performance Factor: [7.7] [8.0] <Insert value>.
- 4. Hot Water:
 - a. Entering-Water Temperature: <Insert **deg F (deg C)**>.
 - b. Leaving-Water Temperature: <Insert **deg F (deg C)**>.
 - c. Water Flow: <Insert **gpm (L/s)**>.
 - d. Water Pressure Drop: <Insert **feet of head (kPa)**>.
- 5. Electric Heat:
 - a. Total Capacity: <Insert **Btu/h (kW)**>.
 - b. Air-Temperature Rise: <Insert **deg F (deg C)**>.
 - c. Control Steps: [One] [Two] [Three] <Insert number>.

C. Auxiliary Electric Heat:

1. Total Capacity: <Insert **Btu/h (kW)**>.
2. Air-Temperature Rise: <Insert **deg F (deg C)**>.
3. Control Steps: [One] [Two] [Three] <Insert number>.

D. Supply-Air Fan:

1. Fan motor.
2. Size: <Insert value> hp.
3. [Multispeed, PSC] [Open-dripproof] [Totally enclosed fan-cooled] type.
4. Total Airflow:
 - a. High: <Insert **cfm (L/s)**>.
 - b. Low: <Insert **cfm (L/s)**>.
5. Outdoor Airflow: <Insert **cfm (L/s)**>.

E. Air-Cooled Condenser:

1. Fan Quantity: [Two] [Four] <Insert number>.
2. Motor Speed: <Insert value> rpm.
3. Motor Horsepower: <Insert value>.

F. Water-Cooled Condenser:

1. Entering-Water Temperature: <Insert **deg F (deg C)**>.
2. Leaving-Water Temperature: <Insert **deg F (deg C)**>.
3. Water Flow: <Insert **gpm (L/s)**>.
4. Water Pressure Drop: <Insert **feet of head (kPa)**>.

G. Filters:

1. Prefilters:
 - a. Type: [Flat] [Pleated] disposable panel.
 - b. MERV: <Insert number>.
 - c. Face Area: <Insert **sq. ft. (sq. m)**>.
 - d. Surface Area: <Insert **sq. ft. (sq. m)**>.
 - e. Thickness or Depth: [2 inches (50 mm)] [4 inches (100 mm)].
 - f. Number of Filters: <Insert number>.
 - g. Maximum or Rated Face Velocity: <Insert **fpm (m/s)**>.
 - h. Initial Resistance: <Insert **inches wg (Pa)**>.
 - i. Recommended Final Resistance: <Insert **inches wg (Pa)**>.
 - j. Access Location: [Front] [Back] [Side].
2. Final Filter:
 - a. Type: [Flat] [Pleated] disposable panel.
 - b. MERV: <Insert number>.
 - c. Face Area: <Insert **sq. ft. (sq. m)**>.
 - d. Surface Area: <Insert **sq. ft. (sq. m)**>.
 - e. Thickness or Depth: [2 inches (50 mm)] [4 inches (100 mm)].

- f. Number of Filters: <Insert number>.
- g. Maximum or Rated Face Velocity: <Insert **fpm (m/s)**>.
- h. Initial Resistance: <Insert **inches wg (Pa)**>.
- i. Recommended Final Resistance: <Insert **inches wg (Pa)**>.
- j. Access Location: [**Front**] [**Back**] [**Side**].

H. Accessories:

- 1. Manual outdoor-air damper.
- 2. Motorized outdoor-air damper.
- 3. Air-side economizer.
- 4. Water-side economizer.
- 5. Hot-gas bypass.
- 6. Air Pressure Switch: Indicates when differential pressure exceeds set point representing dirty filters.

I. Single-Point Electrical Characteristics:

- 1. Volts: [**120**] [**208**] [**230**] [**460**] <Insert value>.
- 2. Phase: [**Single**] [**Three**].
- 3. Hertz: 60.
- 4. Full-Load Amperes: <Insert value>.
- 5. Minimum Circuit Ampacity: <Insert value>.
- 6. Maximum Overcurrent Protection: <Insert amperage>.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Anchor units to structure.
- C. Install seismic restraints.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
 - 1. Water Coil Connections: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Connect to supply and return coil with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.
 - 2. Water-Cooled Condenser Connections: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Connect to supply and return with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.

- B. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- 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 self-contained air conditioners with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. 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.
- C. Tests and Inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation, and inspect for refrigerant leaks.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Units will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. [**Engage a factory-authorized service representative to perform**] [**Perform**] startup service.

3.5 DEMONSTRATION

- A. [**Engage a factory-authorized service representative to train**] [**Train**] Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238119