SECTION 236200 - PACKAGED COMPRESSOR AND CONDENSER UNITS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section Includes:

Compressor and condenser units, air cooled, 1 to 5 tons.

Compressor and condenser units, air cooled, 6 to 120 tons.

* + - 1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer's installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each compressor and condenser unit.

Include rated capacities, operating characteristics, and furnished specialties and accessories.

Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.

* + - * 1. Shop Drawings: For compressor and condenser units.

Include plans, elevations, sections, and attachment details.

Include diagrams for power, signal, and control wiring.

Retain "Coordination Drawings" paragraph below if Drawings do not include detailed plans or if Project involves unusual coordination requirements.

* + - * 1. Coordination Drawings: Plans, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

Retain "Seismic Qualification Data" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 230548 "Vibration and Seismic Controls for HVAC." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Data: Certificates for compressor and condenser units, accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

* + - * 1. Startup service reports.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
        2. Warranty: For special warranty.
      1. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For compressor and condenser units to include in emergency, operation, and maintenance manuals.
      2. COORDINATION
         1. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-In-Place Concrete."
         2. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."
         3. Coordinate installation of steel dunnage and metal work platforms. These items are specified in Section 051200 "Structural Steel Framing," and Section 055000 "Metal Fabrications."
         4. Coordinate location of piping and electrical rough-ins.
      3. WARRANTY

When warranties are required, verify with Director’s Representative's that special warranties stated in this article are not less than remedies available to Director’s Representative under prevailing local laws.

Warranties vary among manufacturers from covering the whole unit up to four years, to only the compressor for five to 10 years or the condenser coil for five years. Extended special warranties are limited to units in the 1- to 5-ton (3.5- to 17.6-kW) range, and then are usually restricted to residential applications.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace components of compressor and condenser units that fail in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Compressor failure.

Condenser coil leak.

Verify available warranties and warranty periods for units and components with manufacturers listed in Part 2 articles.

Warranty Period: [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

Warranty Period (Compressor Only): [**Five**] [**Seven**] [**10**] <**Insert number**> years from date of Substantial Completion.

Warranty Period (Components Other Than Compressor): [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

Warranty Period (Condenser Coil Only): [**Five**] <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS

Retain "Seismic Performance" paragraph below with "Seismic Qualification Data" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with structural engineer.

* + - * 1. Seismic Performance: Compressor and condenser units shall withstand the effects of earthquake motions determined in accordance with [**ASCE/SEI 7**] <**Insert requirement**>. See Section 230548 "Vibration and Seismic Controls for HVAC."

Retain subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

Coordinate "Component Importance Factor" subparagraph below with Section 230548 "Vibration and Seismic Controls for HVAC" and with ASCE/SEI 7.

Component Importance Factor: [**1.5**] [**1.0**].

See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table, for requirements to be inserted in subparagraph below. Coordinate with Section 230548 "Vibration and Seismic Controls for HVAC"

<**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>.

Retain "Wind-Restraint Performance" paragraph below with "Delegated-Design Submittal" paragraph in "Action Submittals" Article for projects requiring wind-restraint design. Model building codes and ASCE/SEI 7 establish criteria for wind loads. Verify requirements of authorities having jurisdiction.

* + - * 1. Wind-Restraint Performance:

See [**Section 230548 "Vibration and Seismic Controls for HVAC**] [**Section 230548.13 "Vibration Controls for HVAC"**] for requirements.

* + - * 1. Fabricate and label refrigeration system in accordance with ASHRAE 15 and ASHRAE 34.

Retain "ASHRAE/IES 90.1 Compliance" paragraph below to require compliance with ASHRAE/IES 90.1.

* + - * 1. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6, "Heating, Ventilating, and Air-Conditioning."
        2. 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.
      1. COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 1 TO 5 TONS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=3559) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Carrier Global Corporation](http://www.specagent.com/Lookup?uid=123457160395).

[Continental Products](http://www.specagent.com/Lookup?uid=123457160595).

[Heatcraft Refrigeration Products LLC](http://www.specagent.com/Lookup?uid=123457160596).

[Lennox Industries, Inc.; Lennox International](http://www.specagent.com/Lookup?uid=123457160392).

[Rheem Manufacturing Company; Heating and Cooling Products](http://www.specagent.com/Lookup?uid=123457160393).

[Ruud Air Conditioning Division](http://www.specagent.com/Lookup?uid=123457160394).

[Trane](http://www.specagent.com/Lookup?uid=123457160396).

[YORK; brand of Johnson Controls International plc, Building Solutions North America](http://www.specagent.com/Lookup?uid=123457160397).

Approved equivalent.

* + - * 1. Description: Factory assembled and tested; consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.
        2. Compressor Type: Scroll, hermetically sealed, with rubber vibration isolators.

Motor: [**Single**] [**Two**] [**Variable**] speed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

Two-speed compressor in first subparagraph below is not available from all manufacturers.

Two-Speed Compressor: Include manual-reset, high-pressure switch and automatic-reset, low-pressure switch.

Variable-speed compressor in first subparagraph below is not available from all manufacturers. Consult manufacturers.

Variable-Speed Compressor: Include manual-reset, high-pressure switch and automatic-reset, low-pressure switch.

Accumulator in subparagraph below is available only on 4- and 5-ton units.

Accumulator: Suction tube.

* + - * 1. Refrigerant: [**R-410A**] [**or**] <**Insert type**>.

Retain copper fins for harsh environments where corrosion between dissimilar metals could decrease service life. Subcooler circuits are not standard features for most small units. Before retaining this option, verify availability with manufacturers.

* + - * 1. Condenser Coil: Seamless copper-tube, [**aluminum**] [**copper**]-fin coil; [**circuited for integral liquid subcooler,**]with removable drain pan and brass service valves with service ports.
        2. Condenser Fan: Direct-drive, metal propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection[**and ball bearings**].

Fin Spacing: [**Eight**] [**20**] [**22**] <**Insert value**> per inch.

* + - * 1. Accessories:

Revise list of accessories below to suit Project. Not all accessories are available from all manufacturers.

Crankcase heater.

Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.

[**Electronic programmable thermostat**] [**Low-voltage thermostat and subbase**] to control compressor and condenser unit and evaporator fan.

Evaporator Freeze Thermostat: Temperature-actuated switch that stops unit when evaporator reaches freezing temperature.

Filter-dryer.

High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.

Liquid-line solenoid.

Low-Ambient Controller:

Retain one of first two subparagraphs below if required. Verify the lower limit of low-temperature operation with manufacturer.

Cycles condenser fan to permit operation down to [**30 deg F**] [**0 deg F**] [**with time-delay relay to bypass low-pressure switch**].

Controls condenser fan speed to permit operation down to minus 20 deg F [**with time-delay relay to bypass low-pressure switch**].

Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.

Plastic mounting base.

Precharged and preinsulated suction and liquid tubing.

Sound Hood: Wraps around sound attenuation cover for compressor.

Thermostatic expansion valve for installation at evaporator coil.

Fixed orifice for installation at evaporator coil.

Time-Delay Relay: Continues operation of evaporator fan after compressor shuts off.

Retain first subparagraph below for heat pump units.

Reversing valve.

<**Insert accessories**>.

* + - * 1. Unit Casing: Galvanized steel, finished with [**baked enamel**] [**baked powder-coat**]; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gauge ports on exterior of casing.

If Project has more than one type or configuration of compressor and condenser unit, delete "Capacities and Characteristics" paragraph below and schedule units on Drawings.

* + - * 1. Capacities and Characteristics:

Compressor and Condenser Unit:

Full-Load Cooling Capacity: <**Insert MBh**>.

Retain "Energy-Efficiency Ratio (EER)," "Seasonal Energy-Efficiency Ratio (SEER)," or "Coefficient of Performance (COP)" subparagraph below.

Energy-Efficiency Ratio (EER): <**Insert value**>.

Seasonal Energy-Efficiency Ratio (SEER): <**Insert value**>.

Coefficient of Performance (COP): <**Insert value**>.

Compressor Suction Temperature: <**Insert deg F**>.

Repeat "Refrigerant Connections" subparagraph below for multiple-circuit units.

Refrigerant Connections:

Liquid Pipe Size: <**Insert NPS**>.

Suction Pipe Size: <**Insert NPS**>.

Connection Type: [**Brazed**] [**or**] [**flared**].

Compressor:

Number of Compressors: <**Insert value**>.

Motor Speed: <**Insert value**>.

Rated-Load Amperes: <**Insert value**> A.

Locked-Rotor Amperes: <**Insert value**> A.

Power Input: <**Insert kilowatts**>.

Air-Cooled Condenser:

Ambient-Air Temperature: <**Insert deg F**>.

Airflow: <**Insert cfm**>.

Number of Condenser Fans: <**Insert number**>.

Condenser Fan Motor Size: <**Insert horsepower**>.

Electrical Characteristics:

Kilowatt Input: <**Insert value**>.

Volts: [**208**] <**Insert value**> V.

Phase: [**1**] <**Insert value**>.

Hertz: [**60**] <**Insert value**> Hz.

Maximum Circuit Ampacity: <**Insert value**> A.

Maximum Instantaneous Current Flow during Startup: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert value**> A.

* + - 1. COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 6 TO 120 TONS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=3560) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Carrier Global Corporation](http://www.specagent.com/Lookup?uid=123457160406).

[Daikin Applied](http://www.specagent.com/Lookup?uid=123457160403).

[Dunham-Bush, Inc](http://www.specagent.com/Lookup?uid=123457160400).

[Engineered Air](http://www.specagent.com/Lookup?uid=123457160401).

[Lennox Industries, Inc.; Lennox International](http://www.specagent.com/Lookup?uid=123457160402).

[Trane](http://www.specagent.com/Lookup?uid=123457160408).

[YORK; brand of Johnson Controls International PLC, Building Solutions North America](http://www.specagent.com/Lookup?uid=123457160407).

Approved equivalent.

* + - * 1. Description: Factory assembled and tested, air cooled; consisting of casing, compressors, condenser coils, condenser fans and motors, and unit controls.
        2. Compressor:

Retain one of two subparagraphs below.

Hermetic scroll compressor designed for service with crankcase sight glass, crankcase heater, and backseating service access valves on suction and discharge ports.

Capacity Control: [**On-off compressor cycling**] [**Hot-gas bypass**].

Hermetic or semihermetic rotary-screw compressor designed for service with crankcase sight glass, crankcase heater, and backseating service access valves on suction and discharge ports.

Capacity Control: [**On-off compressor cycling**] [**Modulating slide-valve assembly or port unloaders**] [**Variable-frequency controller**] [**Hot-gas bypass**].

* + - * 1. Refrigerant: [**R-407C**] [**or**] [**R-410A**] <**Insert type**>.

In "Condenser Coil" paragraph below, not all manufacturers offer each option. Consult manufacturers.

* + - * 1. Condenser Coil: [**Seamless copper-tube**] [**or**] [**aluminum microchannel-tube**], aluminum-fin coil, including subcooling circuit and backseating liquid-line service access valve.

Factory pressure test coils, then dehydrate by drawing a vacuum and fill with a holding charge of nitrogen or refrigerant.

Provide factory-applied [**baked epoxy**] [**phenolic**] anti-corrosion coating to assembled coil.

* + - * 1. Condenser Fans: Propeller-type vertical discharge; either directly or belt driven. Include the following:

Permanently lubricated, ball-bearing[**totally enclosed, air-over**] motors.

Separate motor for each fan.

Dynamically and statically balanced fan assemblies.

* + - * 1. Operating and safety controls include the following:

Manual-reset, high-pressure cutout switches.

Automatic-reset, low-pressure cutout switches.

Low-oil-pressure cutout switch.

Compressor-winding thermostat cutout switch.

Three-leg, compressor-overload protection.

Control transformer.

Magnetic contactors for compressor and condenser fan motors.

Timer to prevent excessive compressor cycling.

If Project has more than one type or configuration of compressor and condenser unit, delete "Accessories" paragraph below and schedule on Drawings.

* + - * 1. Accessories:

Revise list of accessories below to suit Project. Not all accessories are available from all manufacturers.

[**Electronic programmable thermostat**] [**Low-voltage thermostat and subbase**] to control compressor and condenser unit and its associated evaporator fan.

Low-Ambient Controller:

Retain one of first two subparagraphs below if required.

Cycles condenser fan to permit operation down to 0 deg F [**with time-delay relay to bypass low-pressure switch**].

Controls condenser fan speed to permit operation down to minus 20 deg F [**with time-delay relay to bypass low-pressure switch**].

Gauge Panel: Package with refrigerant circuit suction and discharge gauges.

Hot-gas bypass kit.

Part-winding-start timing relay, circuit breakers, and contactors.

Retain first subparagraph below for heat pump units.

Reversing valve.

Non-fused disconnect switch, factory mounted and wired, for single external electrical power connection. See Section 262816 "Enclosed Switches and Circuit Breakers."

Low-noise fans.

115 V ac convenience, ground-fault circuit interrupter receptacle in weatherproof enclosure.

Vibration isolation [**resilient**] [**spring**] mounts.

Security grilles.

<**Insert accessories**>.

* + - * 1. Unit Casings: Designed for outdoor installation with weather protection for components and controls and with removable panels for required access to compressors, controls, condenser fans, motors, and drives. Additional features include the following:

Steel, galvanized or zinc coated, for exposed casing surfaces; treated and finished with manufacturer's standard paint coating.

Retain first subparagraph below if manufacturer publishes salt spray test data.

Corrosion Resistance: [**500**] [**1000**] <**Insert value**>-hour salt spray test, in accordance with ASTM B117.

Perimeter base rail with forklift slots and lifting holes to facilitate rigging.

Gasketed control panel door.

subparagraph below describes optional accessories, which may not be available from all manufacturers.

Condenser coil [**hail guard**] [**grille**].

* + - * 1. Capacities and Characteristics:

Compressor and Condenser Unit:

Full-Load Cooling Capacity: <**Insert MBh**>.

Retain "Energy-Efficiency Ratio (EER)," "Seasonal Energy-Efficiency Ratio (SEER)," or "Coefficient of Performance (COP)" subparagraph below.

Energy-Efficiency Ratio (EER): <**Insert value**>.

Seasonal Energy-Efficiency Ratio (SEER): <**Insert value**>.

Coefficient of Performance (COP): <**Insert value**>.

Compressor Suction Temperature: <**Insert deg F**>.

Capacity Steps: <**Insert number**>.

Repeat "Refrigerant Connections" subparagraph below for multiple-circuit units.

Refrigerant Connections:

Liquid Pipe Size: <**Insert NPS**>.

Suction Pipe Size: <**Insert NPS**>.

Compressors:

Number of Compressors: <**Insert number**>.

Rated-Load Amperes: <**Insert value**> A.

Locked-Rotor Amperes: <**Insert value**> A.

Power Input: <**Insert kilowatts**>.

Air-Cooled Condenser:

Ambient-Air Temperature: <**Insert deg F**>.

Airflow: <**Insert cfm**>.

Number of Condenser Fans: <**Insert number**>.

Condenser Fan Motor Size: <**Insert horsepower**>.

Electrical Characteristics:

Kilowatt Input: <**Insert value**>.

Volts: <**Insert value**> V.

Phase: <**Insert value**>.

Hertz: <**Insert value**> Hz.

Maximum Circuit Ampacity: <**Insert value**> A.

Maximum Instantaneous Current Flow during Startup: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert value**> A.

* + - 1. MOTORS

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

* + - * 1. 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."

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.

* + - 1. SOURCE QUALITY CONTROL

Retain "AHRI 340/360" option in "Performance Ratings" paragraph below for commercial- and industrial-grade systems from 65,000 to 250,000 Btu/h. For applications less than 65,000 Btu/h, retain "AHRI 210/240" option.

* + - * 1. Performance Ratings: Certify capacity performance ratings of compressor and condenser units in accordance with [**AHRI 210/240**] [**AHRI 340/360**].

Retain "Sound-Power Level Ratings" paragraph below when specifying maximum sound levels. Retain "AHRI 270" option for systems with capacities equal to or less than 136,520 Btu/h. Retain "AHRI 370" option for systems with capacities greater than 136,520 Btu/h.

* + - * 1. Sound-Power Level Ratings: Factory test sound-power-level ratings in accordance with [**AHRI 270**] [**AHRI 370**].

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of compressor and condenser units.
          2. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.
          3. Examine walls, floors, and roofs for suitable conditions where compressor and condenser units will be installed.
          4. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. INSTALLATION
          1. Install units level and plumb, firmly anchored in locations indicated.

Retain one of first two paragraphs below if units are installed on roof.

* + - * 1. Install roof-mounting units on equipment supports specified in Section 077200 "Roof Accessories."
        2. Install roof-mounting units on [**steel dunnage**] [**access platform**] specified in Section 051200 "Structural Steel Framing" or Section 055000 Metal Fabrications, or on equipment supports specified in Section 077200 "Roof Accessories."

Do not retain "Equipment Mounting" paragraph below if units are located on roof.

* + - * 1. Equipment Mounting:

Retain first subparagraph below to require equipment to be installed on cast-in-place concrete equipment bases.

Install compressor and condenser units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-In-Place Concrete."

Retain one of two subparagraphs below. Retain first for projects in seismic areas; retain second for projects not in seismic areas. Indicate vibration isolation and seismic-control device type and minimum deflection in supported equipment schedule on Drawings.

Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

* + - * 1. Maintain manufacturer's recommended clearances for service and maintenance.
        2. Loose Components: Install piping specialties, electrical components, devices, and accessories that are not factory mounted.
      1. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Comply with requirements for piping in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
        2. Where installing piping adjacent to equipment, allow space for service and maintenance.

Retain first paragraph below for units using precharged refrigerant tubing.

* + - * 1. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.

Retain paragraph below for air-cooled compressor and condenser units with field-assembled piping systems.

* + - * 1. Connect refrigerant piping to air-cooled compressor and condenser units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Section 232300 "Refrigerant Piping."
      1. ELECTRICAL CONNECTIONS
         1. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
         2. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
         3. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
         4. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

Retain one of two subparagraphs below. First subparagraph cross-references Section 260553 "Identification for Electrical Systems" and should be retained for consistent electrical identification. Second is an abbreviated version of product specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

* + - 1. CONTROL CONNECTIONS
         1. Install control and electrical power wiring to field-mounted control devices.
         2. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
      2. STARTUP SERVICE
         1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to perform**] [**Perform**] startup service.

Complete installation and startup checks in accordance with manufacturer's written instructions and perform the following:

Inspect for physical damage to unit casing.

Verify that access doors move freely and are weathertight.

Clean units and inspect for construction debris.

Verify that all bolts and screws are tight.

Adjust vibration isolation and flexible connections.

Verify that controls are connected and operational.

* + - * 1. Start unit in accordance with manufacturer's written instructions and complete manufacturer's startup checklist.
        2. Measure and record airflow and air temperature rise over coils.
        3. Verify operation of condenser capacity control device.
        4. Verify that vibration isolation and flexible connections prevent vibration transmission to structure.
      1. FIELD QUALITY CONTROL

Retain "Manufacturer's Field Service," and "Perform the following tests and inspections" paragraphs below to identify who shall perform tests and inspections. If retaining second option in "Manufacturer's Field Service" or "Perform the following tests and inspections" paragraph, retain "Field quality-control reports" paragraph in "Informational Submittals" Article.

Retain "Manufacturer's Field Service" paragraph below to require a Company Service Advisor to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" paragraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform the following tests and inspections [**with the assistance of a Company Field Advisor per OGS Spec Section 014216**]:

Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

Leak Test: After installation, charge system with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.

Operational Test: After electrical circuitry has been energized, start units to confirm proper motor operation and unit operation, product capability, and compliance with requirements.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Verify manufacturer's required airflow over coils.

* + - * 1. Verify that vibration isolation and flexible connections prevent vibration transmission to structure.
        2. Compressor and condenser units will be considered defective if they do not pass tests and inspections.
        3. Prepare test and inspection reports.
      1. DEMONSTRATION
         1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to train**] [**Train**] Facility's maintenance personnel to adjust, operate, and maintain compressor and condenser units.

END OF SECTION 236200