

## SECTION 236200 - PACKAGED COMPRESSOR AND CONDENSER UNITS

### 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:
  - 1. Air-cooled condensing units.
  - 2. Water-cooled condensing units.

#### 1.3 SUBMITTALS

- A. Product Data: For each condensing unit, include rated capacities, operating characteristics, 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.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For condensing units to include in emergency, operation, and maintenance manuals.
- D. Warranty: Special warranty specified in this Section.
- E. LEED Submittal:

Retain subparagraph below for LEED-NC Credit EA 4; coordinate with requirements selected in Part 2 for refrigerants.

- 1. Product Data for Credit EA 4: Documentation required by Credit EA 4 indicating that equipment and refrigerants comply.

#### 1.4 QUALITY ASSURANCE

Retain first paragraph below to allow drawing details based on one manufacturer's product to establish requirements and still allow competition. Coordinate with Division 01 requirements.

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of condensing units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."

LEED-NC Prerequisite EA 2 requires minimum efficiency equal to requirements in ASHRAE/IESNA 90.1-2004.

- D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

Retain paragraph below only for water-cooled condensing units 135,000 Btu/h (39 500 W) and larger.

- A. ASME Compliance: Fabricate and label water-cooled condensing units to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

#### 1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."
- C. Coordinate location of piping and electrical rough-ins.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Compressor failure.
  - 2. Warranty Period (Compressor Only): Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 AIR-COOLED CONDENSING UNITS, 1 TO 5 TONS (3.5 TO 17.6 kW)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation; Carrier Air Conditioning Div.
2. Trane Co. (The); Worldwide Applied Systems Group.
3. York International Corp.

B. Description: Factory assembled and tested, consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.

C. Compressor: Scroll, hermetically sealed, with rubber vibration isolators.

1. Motor: Single speed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

Accumulator below is available only on 4- and 5-ton (14- and 17.6-kW) units.

2. Accumulator: Suction tube.
3. Refrigerant: R-407C or R-410A.

D. Condenser Coil: Seamless copper-tube, aluminum-fin coil; circuited for integral liquid subcooler, with removable drain pan and brass service valves with service ports.

1. Spine-fin coils with continuously wrapped aluminum will not be accepted.

E. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection and ball bearings.

F. Accessories:

1. Coastal Filter: Mesh screen to protect condenser coil from salt damage.
2. Crankcase heater.
3. Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.
4. Solid state electronic control including non-fused disconnect and motor starting contactors.
5. Evaporator Freeze Thermostat: Temperature-actuated switch that stops unit when evaporator reaches freezing temperature.
6. Filter-dryer.
7. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.
8. Liquid-line solenoid.

Retain first two paragraphs below for low ambient operation.

9. Low Ambient Controller: Cycles condenser fan to permit operation down to 0 deg F (minus 18 deg C).

10. Low Ambient Lockout: Locate electric ambient lockout control under a shield on the north side of the building or of the unit.
  11. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
  12. PE mounting base to provide a permanent foundation.
  13. Precharged and insulated suction and liquid tubing.
  14. Sound Hood: Wraps around sound attenuation cover for compressor.
  15. Thermostatic expansion valve.
  16. Time-Delay Relay: Continues operation of evaporator fan after compressor shuts off.
- G. Unit Casing: Galvanized steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

## 2.2 AIR-COOLED CONDENSING UNITS, 6 TO 120 TONS (21 TO 422 kW)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carrier Corporation; Carrier Air Conditioning Div.
  2. McQuay International.
  3. Trane Co.
  4. York International Corp.
- B. Description: Factory assembled and tested, air cooled; consisting of casing, compressors, condenser coils, condenser fans and motors, and unit controls.
- C. Compressor: Scroll type.
1. Capacity Control: Minimum two steps of capacity control for units up to 30 tons, and minimum two circuits with four capacity step control for units larger than 30 tons.
  2. Refrigerant: R-134a, R-407C, or R-410A.
- D. Condenser Coil: Seamless copper-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.
1. Spine-fin coils with continuously wrapped aluminum will not be accepted.
- E. Condenser Fans: Propeller-type vertical discharge; either directly or belt driven. Include the following:
1. Permanently lubricated ball-bearing motors.
  2. Separate motor for each fan.
  3. Dynamically and statically balanced fan assemblies.
- F. Operating and safety controls include the following:

1. Manual-reset, high-pressure cutout switches.
2. Automatic-reset, low-pressure cutout switches.
3. Low oil pressure cutout switch.
4. Compressor-winding thermostat cutout switch.
5. Three-leg, compressor-overload protection.
6. Control transformer.
7. Magnetic contactors for compressor and condenser fan motors.
8. Timer to prevent excessive compressor cycling.

G. Accessories:

1. Solid state electronic control including non-fused disconnect and motor starting contactors.

Retain first two paragraphs below for low ambient operation.

2. Low Ambient Controller: Cycles condenser fans or controls condenser fan speed to permit operation down to 0 deg F (minus 18 deg C).
3. Low Ambient Lockout: Locate electric control under a shield on the north side of the building or of the unit.
4. Gage Panel: Package with refrigerant circuit suction and discharge gages.
5. Hot-gas bypass kit.
6. Part-winding-start timing relay, circuit breakers, and contactors.

H. 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:

1. Steel, galvanized or zinc coated, for exposed casing surfaces; treated and finished with manufacturer's standard paint coating.
2. Perimeter base rail with forklift slots and lifting holes to facilitate rigging.
3. Gasketed control panel door.
4. Nonfused disconnect switch, factory mounted and wired, for single external electrical power connection.

## 2.3 CONDENSING UNITS, WATER COOLED

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation; Carrier Air Conditioning Div.
2. McQuay International.
3. Trane Co. (The); Worldwide Applied Systems Group.
4. York International Corp.

B. Description: Factory assembled and tested, water-cooled; consisting of compressors, water-cooled condensers, bases, and unit controls.

- C. Compressor: Hermetic or serviceable hermetic type; with oil pump, operating oil charge, and suction and discharge shutoff valves. Factory mounted on base using spring isolators. Include the following:
1. Thermally protected compressor motor.
  2. Crankcase heater.
  3. Capacity control using cylinder unloading, suction pressure controlled and discharge pressure operated, designed for unloaded start.
  4. Refrigerant: R-134a, R-407C, or R-410A.
- D. Condenser: Single-pass, tube-in-tube coaxial type; with seamless, integral-finned, copper tube and steel outer shell with water-regulating valve.

Retain paragraph above or first paragraph and subparagraph below.

- E. Condenser: Multipass, shell-and-tube type; with replaceable, seamless, integral-finned copper tubes; positive-liquid subcooling circuit; pressure relief device; liquid-level test cock; purge connection; liquid-line shutoff valve; and angle valve for connection of water-regulating valve.

Retain subparagraph below only if ASME stamp is required.

1. Unit Construction: ASME stamped for refrigerant-side working pressure of 385 psig (2650 kPa) and water-side working pressure of 250 psig (1720 kPa).

- F. Accessories include the following:

1. Discharge-line muffler.
2. Gage panel containing gages for suction, discharge, and oil pressure.
3. Electric solenoid cylinder unloaders.
4. Pump-down relay package.
5. Crankcase cover plates with equalizer connections.

- G. Controls: Factory-mounted and -wired panel with the following:

1. Timer to prevent short cycling.
2. High- and low-refrigerant-pressure safety controls.
3. Power- and control-circuit terminal blocks.
4. Compressor motor starter.
5. Control-circuit on-off switch.
6. Control-circuit fuse.

## 2.4 MOTORS

- A. General requirements for motors are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. 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.

2. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

## 2.5 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate condensing units according to ARI 210/240, ARI 340/360, or ARI 365.

LEED-NC Prerequisite EA 2 requires minimum efficiency equal to requirements in ASHRAE/IESNA 90.1-2004.

1. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1-2004, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- B. Test and inspect shell and tube condensers according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- C. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of condensing units.
- B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.
- C. Examine walls, floors, and roofs for suitable conditions where condensing units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

Retain paragraph below for condensing units mounted on grade.

- B. Install condensing units on concrete base. Concrete base is specified in Division 23 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 03.

Retain paragraph below for units installed on roof.

- C. Install roof-mounting units on equipment supports specified in Division 07.
- D. Vibration Isolation: Mount condensing units on rubber pads with a minimum deflection of 1/4 inch (6.35 mm). Vibration isolation devices and installation requirements are specified in Division 23 Section "Vibration Controls for HVAC Piping and Equipment."
- E. Maintain manufacturer's recommended clearances for service and maintenance.
- F. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
- D. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Division 23 Section "Refrigerant Piping."
- E. Provide servicing apertures or similar devices to facilitate the recapture of refrigerants during service and repair. Provide adequate shutoff valves at locations such as condenser, coils, filter-driers, etc. for service with a minimum change of refrigerant loss.

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. Perform electrical test and visual and mechanical inspection.
  - 2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 5. Verify proper airflow over coils.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- C. Remove and replace malfunctioning condensing units and retest as specified above.



### 3.5 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
  - 1. Inspect for physical damage to unit casing.
  - 2. Verify that access doors move freely and are weathertight.
  - 3. Clean units and inspect for construction debris.
  - 4. Verify that all bolts and screws are tight.
  - 5. Adjust vibration isolation and flexible connections.
  - 6. Verify that controls are connected and operational.
- B. Lubricate bearings on fans.
- C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
- D. Adjust fan belts to proper alignment and tension.
- E. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.
- F. Measure and record airflow over coils.
- G. Verify proper operation of condenser capacity control device.
- H. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- I. After startup and performance test, lubricate bearings and adjust belt tension.

### 3.6 DEMONSTRATION

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

END OF SECTION 236200