

SECTION 236313 - AIR-COOLED REFRIGERANT CONDENSERS

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-cooled refrigerant condensers for [outdoor] [indoor] installation.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Air-cooled refrigerant condensers shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7] <Insert requirement>.
 - 1. 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**]."

1.4 ACTION SUBMITTALS

- A. Product Data: For each air-cooled refrigerant condenser. 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. LEED Submittals:
 - 1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1.
 - 2. Product Data for Credit EA 4: Documentation indicating that air-cooled refrigerant condensers and refrigerants comply.

- C. Shop Drawings: For air-cooled refrigerant condensers. 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. Delegated-Design Submittal: For air-cooled refrigerant condensers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 - 2. Design Calculations: Calculate requirements for selecting vibration isolators[**and seismic restraints**] and for designing vibration isolation bases.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Structural members to which air-cooled refrigerant condensers will be attached.
 - 2. Liquid and vapor pipe sizes.
 - 3. Refrigerant specialties.
 - 4. Piping including connections, oil traps, and double risers.
 - 5. Evaporators.
- B. Seismic Qualification Certificates: For air-cooled refrigerant condensers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-cooled refrigerant condensers to include in emergency, operation, and maintenance manuals.

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. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Standard for Refrigeration Systems."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.8 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in [Section 033000 "Cast-in-Place Concrete."] [Section 033053 "Miscellaneous Cast-in-Place Concrete."]
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."
- C. Coordinate location of refrigerant piping and electrical rough-ins.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 MANUFACTURED UNITS

- A. Description: Factory assembled and tested; consisting of casing, condenser coils, condenser fans and motors, and unit controls.
- B. Refrigerant: [R-22] [R-407C] [R-410A] <Insert type>.
- C. Refrigerant: R-407C or R-410A.
- D. Condenser Coil: Factory tested at 425 psig (2930 kPa).
 - 1. Tube: [1/2-inch- (13-mm-) diameter seamless copper.] [3/8-inch- (10-mm-) diameter seamless copper.] [5/8-inch- (16-mm-) diameter seamless copper.] [5/8-inch- (16-mm-) diameter steel].
 - 2. Coil Fin: [Aluminum] [Steel].
 - 3. Coating: [Thermoplastic vinyl] [Epoxy] [Zinc] [Synthetic resin] [Phenolic] [Polytetrafluoroethylene] [Vinyl ester] [Hot-dip galvanized] [Powder-baked enamel]; <Insert manufacturer's name; trade name>.
 - 4. Circuit: To match compressors[with liquid subcooling coil].

- E. Condenser Fans and Drives: Propeller fans with **[aluminum or galvanized-steel]** **[galvanized-steel]** **[stainless-steel]** fan blades, for **[vertical]** **[horizontal]** air discharge; directly driven with **[permanently lubricated]** **[grease-lubricated]** ball-bearing motors with integral current- and thermal-overload protection.
 - 1. Weather-proof motors with rain shield and shaft slinger.
 - 2. Extend grease lines to outside of casing.
- F. Condenser Fans and Drives: Forward-curved centrifugal fans for **[vertical]** **[horizontal]** air discharge.
 - 1. Fan on steel shaft with self-aligning ball bearings.
 - 2. V-belt drive with minimum of two belts; variable pitch drive pulley.
 - 3. Motor mounted on adjustable slide base.
- G. Operating and Safety Controls: Include condenser fan motor thermal and overload cutouts; 115-V control transformer, if required; magnetic contactors for condenser fan motors and a nonfused factory-mounted and -wired disconnect switch for single external electrical power connection.
 - 1. Fan Cycling Control: **[Head pressure switches]** **[Ambient thermostats]**.
- H. Casings: **[Galvanized or zinc-coated steel treated and finished with manufacturer's standard paint coating]** **[Aluminum]** **[Stainless steel]**, designed for **outdoor installation with weather protection for components and controls**, and with the following:
 - 1. Removable panels for access to controls, condenser fans, motors, and drives.
 - 2. **[Plated]** **[Stainless]**-steel fan guards.
 - 3. Lifting eyes.
 - 4. Removable legs, **[20 inches (500 mm)]** **[30 inches (760 mm)]** **[36 inches (910 mm)]** **[42 inches (1060 mm)]** high.

2.3 CAPACITIES AND CHARACTERISTICS

- A. Heat-Rejection Capacity: **<Insert MBh (kW)>**.
- B. Condensing Temperature:
 - 1. Saturated Discharge Temperature: **<Insert deg F (deg C)>**.
 - 2. Saturated Suction Temperature: **<Insert deg F (deg C)>**.
 - 3. Subcooling Temperature: **<Insert deg F (deg C)>**.
- C. Ambient-Air Temperature: **<Insert deg F (deg C)>**.
- D. Refrigerant Pipe Connections:
 - 1. Number of Connections: **<Insert number>**.
 - 2. Liquid Pipe Size: **<Insert NPS (DN)>**.
 - 3. Suction Pipe Size: **<Insert NPS (DN)>**.
- E. Coils:

1. Arrangement: <Insert description>.
2. Number of Rows: <Insert number>.
3. Fin Spacing: [12 fins/inch (2 mm)] <Insert value>.
4. Total Face Area: <Insert sq. ft. (sq. m)>.

F. Fans:

1. Number of Condenser Fans: <Insert number>.
2. Diameter: <Insert inches (mm)>.
3. RPM: <Insert number>.
4. Total Airflow: <Insert cfm (L/s)>.
5. Condenser Fan Motor Size: <Insert horsepower>.

G. Electrical Characteristics:

1. Kilowatts: <Insert value>.
2. Volts: <Insert value>.
3. Phase: <Insert value>.
4. Hertz: <Insert value>.
5. Maximum Circuit Ampacity: <Insert value>.
6. Maximum Instantaneous Current Flow during Startup: <Insert value>.
7. Maximum Overcurrent Protection: <Insert amperage>.

2.4 MOTORS

A. 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. Enclosure Type: Totally enclosed, fan cooled.
2. 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.
3. Mount unit-mounted disconnect switches on [exterior] [interior] of unit.
4. <Insert unique motor characteristics>.

2.5 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate air-cooled refrigerant condensers according to ARI 460.
- B. 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 air-cooled refrigerant condensers.

- 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 air-cooled condensers 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.
- B. Equipment Mounting:
 - 1. Install air-cooled condenser refrigerant condensers on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in [Section 033000 "Cast-in-Place Concrete."] [Section 033053 "Miscellaneous Cast-in-Place Concrete."]
 - 2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
 - 3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- C. Maintain manufacturer's recommended clearances for service and maintenance.
- D. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Refrigerant Piping: Connect piping to unit with pressure relief, service valve, filter-dryer, and moisture indicator on each refrigerant-circuit liquid line. Refrigerant piping and specialties are specified in Section 232300 "Refrigerant Piping."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform electrical test and visual and mechanical inspection.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Complete manufacturer's starting checklist.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Verify proper airflow over coils.

C. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

D. Air-cooled refrigerant condensers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 STARTUP SERVICE

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

1. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - a. Inspect for physical damage to unit casing.
 - b. Verify that access doors move freely and are weathertight.
 - c. Clean units and inspect for construction debris.
 - d. Verify that all bolts and screws are tight.
 - e. Adjust vibration isolation and flexible connections.
 - f. Verify that controls are connected and operational.
2. Lubricate bearings on fan motors.
3. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
4. Adjust fan belts to proper alignment and tension.
5. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.
6. Measure and record airflow and air temperature rise over coils.
7. Verify proper operation of capacity control device.
8. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
9. After startup and performance test, lubricate bearings.

3.6 DEMONSTRATION

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

END OF SECTION 236313