

SECTION 23 63 13
AIR-COOLED REFRIGERANT CONDENSING UNITS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and "Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Air-cooled condensing units for outdoor installation. These units are associated with AHUs and the DOAS units.
- B. Additional Related Sections include the following:
 - 1. Division 23 Section "Blower-Coil Units" for units with direct expansion cooling coils.
 - 2. Division 23 Section "Refrigerant Piping" for valves and accessories for piping connections to units.

1.3 ACTION SUBMITTALS

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; dimensions; required clearances; methods for assembling components; furnished specialties; accessories; and installation and startup instructions for each model indicated.
 - 1. Rated capacities shall be for the complete, integrated system proposed, including the submitted air conditioning unit / evaporator coil and air cooled condenser.
- B. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Delegated-Design Submittal: For equipment supports indicated to comply with performance and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include design calculations for selecting vibration isolators wind restraints.
 - 2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each condensing unit to include in the maintenance manuals.
 - 1. Include a parts list for each condensing unit, control, and accessory; troubleshooting maintenance guide; and servicing and preventive maintenance procedures and schedule.
- B. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Listing and Labeling: Provide electrically operated equipment specified in this Section that is listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
- 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."
- D. Comply with NFPA 70.
- E. Verification of Performance: Rate air-cooled refrigerant condensers according to ARI 210/240 or 365.
- F. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.
- G. Single Source Responsibility: For DX split systems, a single manufacturer shall be responsible for the integrated performance of the air conditioning unit / evaporator coil and associated air cooled condenser. The components shall be factory engineered and integrated as a single, functional system to meet the scheduled and specified performance. The field-pairing of system components provided by or through more than one manufacturer is not acceptable.

1.7 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 location of refrigerant piping and electrical rough-ins.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Client Agency of other rights the Client Agency may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: A written warranty, executed by Contractor and signed by manufacturer, agreeing to replace components, including parts and labor, that fail in materials and workmanship

within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

1. Warranty Period: Manufacturers standard, but not less than 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONDENSING UNITS, AIR COOLED

- A. Description: Factory assembled and tested, air cooled; consisting of compressors, condenser coils, fans, motors, refrigerant reservoirs, and operating controls.
- B. Casing: 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.
- C. Wind Resistance: The unit assembly shall be factory-engineered and tested to resist wind loads in accordance with the 2018 International Building Code and ASCE Standard 7, as per the project location, Exposure Category B, and a Building Risk Category of III, without the use of supplemental straps or hold downs.
 1. Units shall resist the greater of the following:
 - a. 3-Second Gust Design Wind Speed per ASCE Std. 7-2016.
 - b. 16 lb./sq. ft. multiplied by maximum area of equipment projected on vertical plane normal to wind direction, and 45 degrees either side of normal.
 2. Units that have been approved for use in Miami-Dade County, with a current NOA number, having successfully passed TAS 202 (Uniform Static Air Pressure Test), are also acceptable for meeting the wind resistance provisions above.
 3. Alternative Compliance: Equipment that cannot meet the above wind resistance requirements may be acceptable if supplemental reinforcement is field-provided / field-applied to the equipment by the installing Contractor as alternative method of compliance with the specification, however such reinforcement shall meet with the approval of the Architect / Engineer, the delegated design engineer, and the equipment manufacturer. Refer to Division 23 Section, Hangers and "Supports for HVAC Piping and Equipment" for wind restraint delegated design requirements.
- D. Compressors: Scroll type, hermetically sealed and isolated for vibration, with internal pressure relief.
 1. Motor: Include thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 2. Include manual reset, high-pressure switch and automatic reset, low-pressure switch.
 3. Capacity Control: Provide no less than the quantity of compressors indicated on the Drawings. Hot gas bypass is not acceptable as a substitute for a compressor stage.
 4. Capacity Control for AHUs: Air-cooled condensing units serving AHUs may have a single compressor, on-off.
 5. Capacity Control for DOAS Units: Air-cooled condensing units serving DOAS units shall have a minimum of three (3) stages of capacity control (3 plus 'off'), with the minimum capacity step no more than 33% of the total unit capacity. This shall be accomplished with three (3) on-off compressors or two (2) on-off compressors of unequal size. The use of

one or more compressors that are variable speed or are a digital type compressor is also acceptable. Hot gas bypass is not acceptable as a means of capacity reduction/control.

- a. In addition, two (2) constant speed, equal sized compressors is acceptable if the lead compressor is equipped with an unloader that is acceptable to the unit manufacturer which reduces the net compression ratio of the compressor (e.g. Rawal 'APR' controls). The minimum capacity step shall be no more than 35% of the total unit capacity. The unloading method shall not falsely load the system (e.g. hot gas bypass is not acceptable) nor shall it be a simple refrigerant throttling device, adding compressor lift. The unloader shall reduce both cooling capacity and energy consumption while active.
- E. Refrigerant: R-410A.
- F. Condenser Coil: Copper tube, aluminum-fin coil, or all-aluminum microchannel, with liquid subcooler.
1. Provide the manufacturer's standard factory hail guard accessory.
- G. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated fan motor with thermal-overload protection. Provided with discharge fan guard.
- H. Operating and Safety Controls: Include condenser fan motor thermal and overload cutouts; 115-V control transformer; magnetic contactors for condenser fan motors.
1. Fan Cycling Control: Head pressure switches.
 2. Phase loss protection.
 3. Ground fault protection.
- I. Additional accessories provided shall include the following:
1. Crankcase heater.
 2. Automatic reset timer to prevent compressor rapid cycle.
 3. Factory wired non-fused main unit disconnect switch in a NEMA 3R enclosure for a single unit power connection.
 4. Suction and discharge isolation valves for each refrigerant circuit.
 5. Provide a hard-start kit to enable proper startup of the compressor in accordance with the manufacturer's recommendations to suit the refrigerant line lengths of each installation of this project, the type of expansion valve used, and the outdoor ambient high temperature tolerance temperature indicated below.
- J. Outdoor Ambient Temperature Tolerance Range: Construct the units to tolerate operation in an outdoor air temperature as high as 110 deg. F. Provide a high ambient / hard-start kit package as required to accommodate this range. De-rating below the scheduled capacity and efficiency is acceptable at the high ambient temperature.
1. The outdoor ambient temperature for rating the unit capacity and efficiency shall be as scheduled on the Drawings.
- K. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Trane; a Division of Ingersoll Rand
 2. Carrier; a Division of United Technologies Corp.
 3. Johnson Controls Inc. / York

4. Daikin Applied
5. Engineered Air
6. The manufacturers listed as acceptable in Division 23 Section "Blower-Coil Units".
7. Or equal as approved by the Professional.

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 condensing units according to manufacturer's written instructions.
- B. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
- C. Install grade-mounted units on concrete foundations. Refer to Division 23 Section "Common Work Results for HVAC". Provide neoprene pad type vibration isolators under the unit.
- D. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration Controls for HVAC."
- E. Provide wind restraints. Refer to Division 23 Section "Hangers and Supports for HVAC Piping and Equipment" for requirements.
- F. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

- A. Install piping adjacent to machine to allow service and maintenance.
- B. Piping connections to units provided with externally applied vibration isolation shall include flexible connectors. Conduit connections shall use flexible watertight conduit.
- 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."

- D. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas. Exception: Do not install piping and conduit in concrete masonry (CMU) walls.
 - 1. Lineset Covering Systems: Provide a complete lineset covering system as specified in Division 23 Section "Refrigerant Piping" to conceal refrigerant piping and control conduits associated with the same refrigeration / cooling equipment, where the refrigerant piping is located in a finished space below a finished ceiling, or is located outside and installed along an exterior finished wall surface.
- E. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.
- G. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors.
- H. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors.
- I. Add additional refrigerant and oil as required for the as-installed system.
- J. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls. Ground equipment according to Division 26 provisions.

3.4 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Clean units to remove dirt and construction debris and repair damaged finishes.

3.5 FIELD QUALITY CONTROL

- A. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks and replace lost refrigerant and oil.
- B. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Verify that units are installed and connected according to the Contract Documents.
- D. Air-cooled refrigerant condensers will be considered defective if they do not pass tests and inspections.
- E. Remove and replace malfunctioning units with new units and retest.
- F. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to 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 devices.
 - 8. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
 - 9. After startup and performance test, lubricate bearings.

3.7 DEMONSTRATION

- A. Train Client Agency's maintenance personnel as specified below:
 - 1. Engage a factory-authorized service representative to train maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
 - 2. Review data in the maintenance manuals.
 - 3. Schedule training with the Client Agency, through the Architect, with at least 7 days' advance notice.

END OF SECTION