SECTION 11 53 23
LABORATORY REFRIGERATORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Walk-in site assembled refrigerators for Laboratories. Refer to architectural drawings for dimensions and arrangement of units.

B. Refer to Section 23 23 00, REFRIGERANT PIPING, for piping and insulation.

C. Refer to electrical drawings for lighting.

1.2 RELATED WORK

A. Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

B. Section 23 23 00, REFRIGERANT PIPING.

C. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.

1.3 QUALITY ASSURANCE

A. Sanitary Standard: Walk-in units shall comply with NSF Standard No. 7 and bear the NSF label.

B. Safety Standard: ASHRAE 15 describes requirements for refrigerant containing parts.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Walk-in units, including assembly instructions.
2. Condensing units, with mounting rack where required.
3. Unit coolers.
4. Temperature controls and alarms.
5. Diagrams and details of piping, wiring and controls.

C. Operating Test Data.

D. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Air-Conditioning and Refrigeration Institute (ARI):

420-00.....Unit Coolers for Refrigeration.

520-04.....Performance Rating of Positive Displacement Condensing Units.

C. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
15-10.....Safety Standards for Refrigeration Systems
D. American Society for Testing and Materials (ASTM):
A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel plate, Sheet and Strip
E84-11.....Surface Burning Characteristics of Building Materials
E. National Sanitation Foundation (NSF):
7-09.....Commercial Refrigerators and Storage Freezers.

PART 2 - PRODUCTS

2.1 WALK-IN REFRIGERATOR CONSTRUCTION

A. General: Prefabricated, sectional, all-metal clad, modular, designed for easy accurate field assembly.
B. Room Dimensions: As shown on drawings, 2600 mm (8 foot 6 inches) minimum over-all height, unless shown otherwise.
C. Door Sizes: 914 mm (36 inches)nominal wide by 1980 mm (78 inches) high.
D. Metal Finishes:
1. Inside facing of walls and ceiling, and outside facing of exposed walls: Stainless steel, minimum 0.85 mm thickness (22 gage), No. 3 finish, ASTM A167, Type 302B. Provide stainless steel close-off panels, with supports, from exposed faces of walk-in to ceiling and walls.
2. Concealed outside facings: Embossed aluminum sheet, 1 mm (0.040 inch) thick, or 0.55 thick (26 gauge) galvanized steel panel.
3. Interior floor: 2.5 mm thick (0.100 inch) aluminum.
F. Panel Construction:
1. General: 100 mm (4 inches) thick, precisely formed interior and exterior metal pans, filled with foamed-in-place urethane foam, overall "U" factor 0.03, interchangeable, nominal 300, 600, 900 and 1200 mm (1, 2, 3 and 4 foot) widths, without wood or metal structural members, quick-lock panel fasteners. Provide special locking wrench and press-fit caps to close wrench holes.
2. Corner panels: 90 degree angle, radiuses 15 mm (0.5 inch) inside and out-side, with 300 mm (12-inch) dimensions each side.
3. Panel edges: Foam-in-place, tongue-and-grooved urethane to assure tight joints. Provide gaskets on the interior and exterior of each

panel along every tongue to provide a gasketed seal at each panel joint.

4. Insulation: "Pour-type" urethane, foamed-in-place thermal conductivity (k) not more than 0.017, 97 percent closed cell, flame spread rating 25 or less, when tested in accordance with ASTM E84. Fiberglass, polystyrene or similar materials are not acceptable.
5. Door panel and door: Provide channel thermal breaker type rein-forcing steel frame around the entire perimeter of the door opening. Door shall be an infitting flush-mounted type with dual flexible blade wiper gasket on the bottom, and a replaceable magnetic gasket on the top edge and along both sides. Door shall be super type, with three hinges, for rough usage including aluminum diamond plate on inside of door panel and frame to a height of 914 mm (36 inches).
   a. Door hinges and latch and strike assembly: Manufacturer's standard, self-closing cam-lift type hinges, for 1220 mm (48 inch) door, chrome plated or polished aluminum finish, made to provide for locking, but with an inside safety release mechanism to prevent anyone from being locked inside, when door is locked from outside.
   b. Concealed, energy use selective, anti-sweat heater wire circuit: Provide sufficient heat to prevent condensation and frost formation at the door jambs and exterior edges of the door on all sides.
   c. Door panel and inside lighting: Vapor proof 48" fluorescent with T5 bulbs and low temperature electronic ballast. Provide exterior toggle switch and pilot light, and top mounted junction box. This switch shall operate all lights in the walk-in refrigerator. See electrical drawings for lights and installation.
6. Floor panel strength: Capable of withstanding 28.7 kPa (600 pounds per square foot) uniform load.

G. Entrance Ramps: Provide built-in ramps where walk-in floor panels are installed on existing floors. Provide non-skid surface on ramp.

H. Control Panel: Provide scientific control panel with programmable temperature controller, liquid crystal display, simultaneous product and air temperature display, system mode indicator, high/low audio and visual alarm with dry contacts for interface with building ECC, system

over/under temperature, power failure alarm, and service prompts, keyed locked door with viewing cover.

I. Refrigerant System: Provide two completely separate R-404a refrigeration systems complete with separate air cooled condensers, evaporators, compressors, refrigerant specialties, and with multi compressor control as follows:

a. Automatic backup compressor operation in event of lead compressor failure.

b. Simultaneous compressor operation based on cooler cooling requirement.

c. Automatic, time based, lead compressor rotation with user selected time period.

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2.2 CONDENSING UNITS

A. Comply with ARI Standard 520. Air cooled type, motor driven integral compressor, motor starter, condenser, receiver, common base, and safety/operational controls. Receiver capacity shall be not less than 125 percent of system refrigerant charge. For units racked one above the other and for units installed in a closet, provide a factory fabricated steel rack extending approximately 1150 mm (45 inches) above the floor. For larger freezers provide two condensing units and unit coolers with independent refrigeration systems as shown. Do not locate compressors on top of refrigerator or freezers.

B. Provide positive oil lubrication and oil level indicating device for each compressor. Provide water regulating valve for water cooled unit.

C. Compressor Motor: Squirrel cage induction type of ample size for continuous operating at maximum compressor performance indicated. Provide inherent (Klixon) protection, in compressor terminal box, for each phase of motor.

D. Pressure Switches: Automatic reset low pressure switch, and automatic or manual reset high pressure cutout.

E. Air Cooled Condensing Units:

1. Accessible hermetic, R-404a, remote refrigeration system.
2. Two tier rack arrangement.
3. 208V, 1 phase, 60 Hz electrical.
4. System capacity 5080 BTU's/hour at 90° ambient temperature.
5. Calculated load for 2 to 8°C is 1867 BTU's/hour calculated from 24.0° C. ambient temperature, 21.1° C floor temperature (insulated floor), 16 minutes open door time per 24 hours for (1) 36" X 78"

walk-in door, opening into 24° C. ambient, no vent air, no people working in the room, no additional electrical load, and (1) 106 watt light operating 12 hours per day.

6. The condenser fans shall be driven by permanent split capacitor motors.

2.3 UNIT COOLERS

A. Comply with ARI Standard 420. Units shall be low profile UL listed, forced-ventilation type integral defrosting, internal or external refrigerant distributor, single or multiple fans and motors, drip-pan, deflectors, aluminum or baked-enamel steel housing, hangers, and all accessories.

B. Motors: Permanent split capacitor type in accordance with Section 11 05 12, General Motor Requirements for Equipment. Provide motors with thermal overload protection. Provide manual starting switch.

C. Drain Pans: Galvanized sheet steel. Provide additional drain pans under uncovered refrigerant connections, and interconnect them with main drain pan.

D. Defrost Provision:

1. Refrigerators: Defrost shall occur during compressor off cycle with evaporator fan running continuously.

2.4 PIPING, PIPE INSULATION, AND REFRIGERANT AND OIL CHARGES

Refer to Section 23 23 00, REFRIGERANT PIPING

2.5 EQUIPMENT IDENTIFICATION REQUIREMENTS

A. Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

B. Identify all refrigeration equipment and alarm devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install refrigeration equipment as described in the respective manufacturer's instructions. Make panel joints tight and seal all panel penetrations to prevent condensation or frosting.

1. Unit cooler: NSF approval requires that the unit be suspended at 90 mm (3-1/2 inches) minimum distance below the ceiling to allow cleaning the top of the unit cooler.

2. To the extent feasible, mount pipe, conduit, and instrumentation on the exterior and pass thru neatly drilled penetrations to the lights or other devices.

B. Piping, Pipe Insulation and Refrigerant: Provide in accordance with Section 23 23 00, REFRIGERANT PIPING.

C. Controls Installation: As specified in Section 23 09 23, Direct-Digital Controls Systems for HVAC.

3.2 REFRIGERATOR START-UP, AND PERFORMANCE TESTS AND INSTRUCTIONS

A. Start-up Temperature Reduction: On start-up, reset the room thermostats daily for a maximum temperature drop of 8 degrees, on C scale (15 degrees on F scale per day down to 2 degrees C (36 degrees F), and a maximum of 6 degrees on C scale, (10 degrees on F scale) per day between 2 degrees C (36 degrees F) and final operating temperature.

B. Perform test in accordance with Section 01 00 00, GENERAL REQUIREMENTS. Operate each system and record conditions hourly for eight hours. Submit the following information:

1. Station, Building and System Identification, Contractor, Date and Time.
2. Compressor nameplate data: Make, model, horsepower, RPM, refrigerant and charge in pounds.
3. Compressor operation: Approximate percentage running time, pressure gage readings, actual amps (starting and running), condenser water temperature in and out, or condenser entering air temperature.
4. Room temperatures.
5. Defrost and drain functions of unit coolers. Demonstrate alarm functions.

C. By arrangement with the Resident Engineer, 24 hours in advance, use the start-up and test period for required operation and maintenance instructions to VA personnel in accordance with Section 01 00 00, GENERAL REQUIREMENTS.

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