

**DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING
(HVAC)
23 61 00 REFRIGERANT COMPRESSORS**

PART 1 - GENERAL

1.01 SUMMARY

- A. General: Refrigeration work includes freezers, cold rooms, built-up controlled atmospheric room or direct expansion air conditioning system.
- B. Direct expansion type systems with single or multiple evaporators are preferred.
- C. Warranty: A five year written warranty shall be provided for all compressors and condensing units.
- D. Alarms:
 - 1. Freon Alarms: Walk in freezers and coolers shall have alarms to warn of Freon leaks. These alarms must be audible from outside of the unit, and shall forward to the WSU BAS.
 - 2. Personnel Alarms: Walk-in freezers shall have personnel alarms. These alarms shall forward to WHITCOM. High temperature alarms must be separate from personnel alarms.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Equipment and Installation:
 - 1. Packaged Heating or Cooling Units: High efficiency units are preferred. In specifications and submittals, highlight unit efficiency in Kilowatts per Ton.
 - 2. Compressors: Crankcase heaters shall be used where units will operate at ambient temperatures of under 50 degrees F or control cycle is such that it is possible for liquid refrigerant to be returned to crankcase when unit is on an "off" cycle.
 - 3. Condensing Units:
 - i. Condensing units shall be installed in a ground-level condenser room. In general, they shall not be mounted on top of walk-in refrigerators or freezers or cold rooms.

**DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING
(HVAC)
23 61 00 REFRIGERANT COMPRESSORS**

- ii. Condensing units shall be complete with compressor and condenser in a single package, and shall include dual pressure controls, oil failure protection control (where applicable), pressure gauges with valves, quick trip overload relay. Compressors on low temperature units shall be supplied with forced draft or water jacket cooling. Sufficient room shall be provided to facilitate cleaning of condenser units. Compressors on variable loads shall be provided with capacity either by means of cylinder unloading or hot gas bypass.
 - iii. Air-cooled condensing units are preferred, where practical. Special consideration must be given to control of condenser head pressure where air-cooled condensers are to be operated below 40 degrees ambient or year-round. Banks of air-cooled condensing units shall be located in a room with temperature controlled through ventilation to maintain proper ambient temperature.
 - iv. Condensing units may be water cooled where process water cooling is available from the Central Chilled Water system. Water-cooled condensers shall be cleanable straight-through-tube type with removable heads.
 - v. Receivers shall be provided as necessary to allow for pump down of entire system and capable of holding full refrigerant charge. Condensing units shall be equal to those manufactured by Copeland, Carrier, or Tecumseh.
 - vi. Installation and Maintenance:
 - 1) All field installed condensing units (packaged equipment excluded) 5 hp and larger shall have hour meters installed to record machine running time. Crankcase oil shall be changed after the first 500 hours of operation or not more than 30 days from start-up time, whichever comes sooner. Oil shall be changed again after an additional 4500 hours of running time or not more than nine months from date of startup.
 - 2) On units smaller than 5 hp, oil shall be changed 30 days after system start-up and again nine months from start-up.
4. Evaporators: Evaporators used in rooms where close temperature gradient is expected shall be low velocity units.
- i. Where fin corrosion (due to alcohol or gasses used in cold room) is possible, use a unit with special coating such as a vinyl-acrylic resin.
 - ii. On coil temperatures below 33 degrees F, defrost will be needed. Where defrost is needed, the automatic electric type is preferred. Defrost cycle shall be started by a time clock and run until a sensor

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) 23 61 00 REFRIGERANT COMPRESSORS

indicates the coil is free of frost and ice and with automatic end of cycle at a predetermined time.

- iii. Where two or more evaporators are operating on one condensing unit, each evaporator shall have its own time clock and sensor controls so that the defrost cycles can be staggered so as not to overload the condensing unit on recycling.

B. Piping and Accessories:

1. Refrigerant piping shall be type "L" copper (hard drawn, ACR) with wrought fittings soldered with high temperature solder like silver solder.
2. Copper drain lines from evaporator condensate pans shall not run in cold walls. Drain line traps shall be outside of cold room to prevent air entrance when not in defrost cycle.
3. Low temperature drain lines shall be run exposed with electric heating tapes. Door mullion or gasket in low temperature rooms shall be electrically heated.
4. Liquid and suction lines shall be individually supported in an approved manner. Support clamp shall be provided with rubber grommets to allow for expansion and contraction and insulation.
5. Vibration isolators shall be used at compressors or condensers where necessary to avoid noise transmission. Isolators shall be in horizontal runs to avoid condensate accumulation and freezing in end connections.
6. Install Sporlan "Catch-All-Filters" or equal, with bypass in suction liquid line close to compressor. On units, five ton capacity and larger, provide renewable cartridge type filter/dryer in liquid line.
7. Liquid line shall have Sight Glass with moisture indicator.
8. Pressure gauges shall be provided on both liquid and suction lines. Thermometers shall be provided on chilled water and condenser water inlet and outlet lines to chillers. Hand shut-off valves shall be installed in all gauge lines.
9. Suction lines shall be insulated with closed cell elastomeric type insulation with minimum of 3/4 inch wall thickness. Liquid lines shall be insulated with a minimum wall thickness of 3/4 inches where the line is exposed to outside elements or extreme heat.

**DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING
(HVAC)
23 61 00 REFRIGERANT COMPRESSORS**

10. Suction riser installations require special design for oil return (i.e., oil traps, double suction risers). Piping lines shall have a "P-trap" installed at the base of any vertical rise greater than three feet (3 ft). In long suction risers, P-traps shall be installed on each floor of vertical rise, never to exceed twenty feet (20 ft) of vertical rise. A suction riser is any vertical line which has an upward refrigerant flow.
11. Horizontal Suction Lines should slope toward the compressor (minimum one half inch per ten feet (1/2 inch per 10 feet). The horizontal suction line shall be sized for a minimum pressure drop with proper refrigerant velocities.

C. Testing and Charging:

1. Pressure test system for 12 hours to 300 psig high side and 150 psig low side using CO₂ or dry nitrogen (oil pumped) and a trace of Freon. Leak test with Halide torch and repair all leaks. Double dehydrate system with vacuum pump capable of producing 29 inch vacuum on system. Charge system with refrigerant and place into operation. Compressor oil shall be compatible with the type of refrigerant used in the system, per the manufacturer's recommendations.
2. Built-up temperature controlled rooms such as controlled atmosphere rooms where close control is expected shall have sufficient tests run with recording instruments to assure that the system is operating properly and that specified conditions are being met. Manufacturer's representative shall administer the tests.

PART 3 - EXECUTION (NOT USED)

END OF SECTION