

---

**PART 1 - GENERAL**

These standards apply to the design and installation of Chiller equipment and accessories.

**1.01      DESIGN CRITERIA**

**A. Drawings and Specifications:**

1. Indicate unit dimensions, weight loading, required clearances, electrical characteristics and connection requirements.
2. Include equipment schedules: Identification tag, refrigerant, capacities, flow rates, part load ratings, electrical requirements, weights, etc.
3. Indicate service access requirements on plans and coordinate with all other disciplines.
4. Indicate control valves and DDC control panel locations.
5. Provide connection detail for equipment.
6. Provide valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
7. Provide isolation valves on all equipment. Locate valves, control valves, balancing valves and control components for accessibility.
8. Safety Valves: Set at pressure and locate vents required by code.

**B. Design:**

1. Refrigerant: Selected in compliance with RCW 70A.60 Hydrofluorocarbons – Emissions Reduction.
2. Evaporator Description: Shell-and-tube design with refrigerant totally enclosed in shell and water in tubes. The vessel shall display an ASME nameplate and “U” stamp for ASME Section VIII, Division 1.
3. Condenser: Shell-and-tube design with water enclosed in tubes and refrigerant enclosed in shell. The vessel shall display an ASME nameplate and “U” stamp for ASME Section VIII, Division 1.
4. Piping: Header and main distribution piping system with 10 to 15 percent extra capacity, maximum water velocity = 8-feet per second, maximum water pressure drop of 4-feet per 100 linear feet

- 
5. Chilled Water Cooling: Design for 42 degrees F leaving chilled water and 16 degrees F  $\Delta t$ .
  6. Plate Frame Heat Exchanger: Design for 52 degrees F leaving chilled water and 16 degrees F  $\Delta t$ .
  7. Controls: Direct Digital Controls System Interface shall be utilized and be capable of transmitting operating data to a Siemens building automation system.
  8. Vibration Isolation and Seismic Restraints: Provide vibration isolation with seismic restraints. Secure unit, components and accessories in accordance with seismic requirements per code.
  9. Provide calculations documenting compliance with International Mechanical Code Chapter 11 for Refrigerant Machinery Rooms, including refrigerant type, refrigerant charge per circuit, room volume, and refrigerant charge per 1000 ft<sup>3</sup>.
  10. Sound Criteria: Maximum 86 dBA while operating under full load conditions at 4-6 feet from unit.
  11. Do not use the following:
    - 1) Condensing units within the building space.

## **PART 2 - PRODUCTS**

### **2.01 CHILLERS**

- A. Manufacturers: Chillers: Carrier, York, McQuay, or approved equal.
- B. Plate Frame Heat Exchangers: Alfa Laval Thermal, Inc., Bell & Gossett, ITT Fluid Handling; Div. of ITT Fluid Technology Corp.
- C. Water Chiller Description:
  1. Factory-assembled, single piece, liquid chiller including open drive, centrifugal single 2-stage compressor, motor, lubrication system, evaporator, condenser, initial oil and refrigerant operating charges, microprocessor control system and interconnecting piping and wiring.
  2. Factory installed epoxy coating on evaporator and condenser marine water boxes. Provide with hinged covers on condenser water box.

D. Compressors:

3. Shaft and Impeller Assembly: Carbon or forged steel shaft with cast high strength aluminum alloy impellers, designed and assembled for no critical speeds within operating range; and statically and dynamically balanced.
4. Casing: Fine grain cast iron with gasket sealed casing joints.
5. Drive Assembly: Gear transmission integral with compressor and lubricated through compressor lubrication system.
6. Gear Assembly: Double helical type gears, with journal bearings Babbitt lined and pressure lubricated; provide inspection openings, to facilitate bearing inspection and replacement without disassembly or removal of compressor casing or impeller.
7. Lubrication System: Forced circulation type, with positive displacement submerged pump and replaceable oil filter; complete with an automatic oil heater designed to separate refrigerant from oil, and oil cooler if required for proper performance.

E. Evaporator and Condenser:

1. Shell-and-tube design with refrigerant totally enclosed in shell and water in tubes.
2. Shell Material: Carbon-steel plate.
3. Tube Sheets: Fabricated of 3/8" min. thick carbon steel sheets welded to the shell and drilled for tubes. Include intermediate tube support sheets as required to prevent tube vibration.
4. Tubes: Seamless, Copper high-efficiency type, cleanable, externally finned, individually replaceable tubes; expanded into tube sheets.
  - a. Size: 3/4-inch OD, 0.028-inch wall thickness; or 3/4-inch OD, 0.025-inch minimum wall thickness with skipped fin tube design.
  - b. Tubes shall be individually replaceable from either end of the heat exchanger without affecting the strength and durability of the tube sheets.

F. Water Boxes: Marine type (both ends), carbon steel, with vent and drain (2-inch) connection. Water box nozzles shall have stub outs beveled for welded connections.

1. Provide epoxy coating. The epoxy coating shall be Plasite 7156 or approved equal. Preparation shall include degreasing and sandblasting in accordance

with the manufacturer's recommendations for immersion service. The epoxy shall be applied in a two-coat process with a minimum thickness of 10 to 12 mils.

2. Insulation: Factory applied to evaporator, suction lines, and other surfaces where condensation might occur, with flexible elastomeric insulation of the following thickness:
3. Pressure Relief: Single or multiple, reseating-type, spring-loaded relief valves.

**G. Pumpout Unit:**

1. Unit Mounted Pumpout Unit:
  - a. The chiller shall be provided with a unit mounted refrigerant storage tank that is separate from the evaporator and condenser. Refrigerant isolation valves shall be provided to allow storage of the entire refrigerant charge in the unit mounted storage tank during service. A factory installed refrigerant transfer unit complete with starter shall be provided and installed. The transfer unit shall include a transfer compressor and water-cooled condenser, plus factory installed refrigerant piping between the tank and the chiller heat exchangers, electrical controls and terminal box.

**H. Sound Attenuation:**

1. Maximum 86 dBA while operating under full load conditions. To meet this condition, the manufacturer may use a factory-installed acoustic blanket with stainless steel fasteners. The blanket shall cover condenser heat exchanger, discharge line and compressor as necessary to meet the above sound levels. The blanket shall be removable for service.
  - a. Measure sound pressure level in accordance with AHRI Standard 575.
  - b. Indicated sound pressure levels are mean pressure levels, 5-feet from major machine surfaces under free field conditions.

**I. Control Panel:**

1. Manufacturer's standard microprocessor-based chiller controls; unit mounted, and factory wired with a single-point power connection and separate control circuit.
2. DDC Control System Interface: Each chiller shall be capable of transmitting all major chiller operating and safety information to a Siemens building automation system. In addition, the interface shall enable Siemens to write to

---

any system variable in the chiller controller, including chiller start/stop, chilled water setpoint adjustment and demand limit adjustment.

J. Motor Starter: General: Autotransformer starter shall be provided and installed.

K. Motors:

1. Open Drive Chillers
2. Totally Enclosed Water to Air Cooled. TEWAC.

L. Plate Frame Heat Exchangers:

Configuration: Counterflow, ASME rated, freestanding assembly consisting of frame support, fixed and movable end plates, tie rods, plates, and one-piece gaskets. 100 psig minimum working pressure, 150 psig test pressure.

END OF SECTION