

WVU DESIGN GUIDELINES & CONSTRUCTION STANDARDS
DIVISION 23 – HEATING, VENTILATION, AND AIR CONDITIONING

SECTION 236416 - CHILLERS

PART 1 - GENERAL

- 1.1 Any deviance from the following instructions must be approved during design by WVU Facilities Management project manager.
- 1.2 It is preferable to connect to a campus main chilled water loop if a campus chilled water system is available.
- 1.3 For a multiple chiller installation, the primary chiller shall be selected on full load efficiency. Secondary and stand alone chillers shall be selected on their IPLV rating.
- 1.4 The Calculation of Integrated Part Load Value, (IPLV) shall be per ASHRAE standard 550/590 methods.
- 1.5 If a facility is to use a stand-alone chiller and requires continuous chilled water supply, the chilled water systems must be design for N+1 redundancy. The requirement to design the chilled water system for N+1 redundancy will be determined by Facilities Management Engineering group.
- 1.6 Any chillers, cooling towers, and/or piping shall be cleaned using flushing methods approved by WVU water treatment vendor on file in order to remove any fillings, dirt, oil, and other debris or compounds that were used as part of the fabrication/installation process.
- 1.7 All installed units must at a minimum meet Manufacturers' distance requirements. Access points for maintenance should be given additional attention for proper clearance so as NOT to hamper future maintenance of the system.
- 1.8 For crane use consult WVU Facilities Management Crane Use and Rigging SOP.

PART 2 - PRODUCTS

- 2.1 WVU preferred brands: Carrier, Trane, and York
- 2.2 Efficiency, IPLV, for each type of chiller system must meet or exceed the latest ASHRAE Standard 90.1.
- 2.3 Chiller Requirements
 - A. General: All chillers selected shall be identical products from the same manufacturer and meet the criteria specified below. Chillers shall be capable of unloading down to 15% of the full load capacity.
 - B. Evaporator performance:
 1. Entering Chilled Water Temperature: 55 deg F

2. Leaving Chilled Water Temperature: 41 deg F
3. Design Chilled Water GPM/Ton: 1.7
4. Maximum Evaporator Pressure Drop: 30 ft H₂O
5. Variable evaporator flow (if VFD motors selected)
6. Fouling Factor: 0.00025

C. Condenser performance:

1. Entering Condenser Water Temperature Range: 85 deg F – 65 deg F
2. Leaving Condenser Water Temperature Range: 95 deg F – 55 deg F
3. Design Condenser Water GPM/Ton: 3.0
4. Maximum Condenser Pressure Drop: 30 ft H₂O
5. Fixed Condenser Water Flow
6. Fouling Factor: 0.00025

2.4 Use water cooled condensers for all systems over 300 tons.

2.5 Designers must dictate the usage of the most environmentally friendly refrigerant available for the specified chiller. If a design calls for refrigerants different than the above mentioned then it shall be reviewed by WVU Facilities Management. The brand and model of chiller detailed in the Drawing Schedules must reflect this decision.

2.6 Chiller features

- A. WVU prefers to not use glycol in chiller systems, but if the situation dictates follow the glycol rules mentioned in standard.
- B. Building management system interface capability with full graphics. See Section 230900, Controls, in the Design Guidelines for details.
- C. Variable frequency drives, (VFD), shall be considered if available. If a VFD is available, an economic analysis shall be conducted and presented to WVU to show payback period.
- D. Capability for extended operation with 55 degree F entering condenser water temperature
- E. Marine water boxes shall be installed on condensers on large centrifugal chillers. The boxes shall have either hinged ends or lifting lugs to facilitate removal.
- F. Surfaces with an operating temperature lower than 65 degrees F shall be covered with a minimum of 3/4" insulation @ k = 0.28 btu in/hr ft² F.
- G. Refrigerant isolation valves
- H. If a chiller can be installed without being broken down, it shall be shipped pre-charged with refrigerant and oil.
- I. Tap on oil system to draw samples for testing
- J. Magnetic drive chillers shall be considered if available. If magnetic drive chillers are available, an economic analysis shall be conducted and presented to WVU to show life cycle cost of magnetic versus conventional drive chillers.
- K. Any external piping above ground containing ONLY water should be insulated and double heat traced on separate electrical current with a control that energizes the heat trace below 40° F.

PART 3 - EXECUTION

- 3.1 Machines with multiple compressors shall have at least two separate refrigerant circuits.
- 3.2 If connected to outdoor piping, chillers shall be capable of utilizing a water/ethylene glycol mixture consisting of 35 – 40% concentration by weight, with deionized water, corrosion inhibitors effective for water based fluids, and additional additives to buffer and neutralize acidic glycol degradation. This shall be supplied and installed by the on-site mechanical contractor. This mixture will protect the equipment down to -5 to -10 degrees F. Only propylene glycol will be used in coolant mixtures used in food service areas or with food service equipment.
- 3.3 The potable water supply shall NOT be directly connected to any system, piping, or component containing ethylene glycol mixtures. Water shall ONLY be provided to ethylene glycol containing systems by use of air gaps. Air gaps shall be provided by use of rigid piping and not by flexible hoses so as to assure maintenance of proper air gap distance.
- 3.4 Systems containing only propylene glycol mixtures or water only systems may use a Reduced Pressure Zone Backflow Preventer or air gaps for protecting the makeup water connections.
- 3.5 Plumbing containing glycol solutions shall be identified as not being potable water along the entire length of piping. Signage shall state the type of glycol used or contained within the system.
- 3.6 Chiller systems utilizing glycol shall have signage identifying the type of glycol (i.e., propylene glycol or ethylene glycol) that is used for the system, the glycol mixture's concentration, and spill reporting requirements at the makeup water/solution mixing locations.
- 3.7 Large process cooling requirements shall be met by a dedicated cooling system.
- 3.8 Chillers shall be equipped with an internal flow sensor to ensure flow prior to start and after shutdown. The condenser water flow on steam chillers must continue for 30 minutes after chiller shutdown.
- 3.9 Use multiple same size chillers in centralized chilled water plants.
- 3.10 Chiller controls must be able to interface with Siemens, Invensys, and Automated Logic building management systems. These are the only three building management systems allowed at WVU. See Section 230900 in the Design Guidelines for details.
- 3.11 Noise level in a chiller room shall be less than 85 dBA per OSHA 29 CFR 1910.95. Sound attenuation devices shall be installed if noise level exceeds 85 dBA.

END OF SECTION 236416