

PART 1: GENERAL

1.01 Purpose:

- A. This standard is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. The responsibility of the engineer is to apply the principles of this section so that the University may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be justified through LCC analysis and submitted to the University for approval.

1.02 References:

- A. ASME Compliance: Fabricate and install hydronic piping in accordance with ASME B31.9 "Building Services Piping." Piping for all chilled and hot water shall be fabricated and installed in accordance with ASME B31.1.
- B. HI Compliance: Design, manufacture, and install pumps in accordance with HI "Hydraulic Institute Standards."
- C. NEMA Compliance: Provide electric motors and components which comply with NEMA standards.

1.03 Requirements:

- A. All Chilled Water Underground Piping shall be HDPE – 24” header/ 8” reduced. Avoid 3½” and 5” pipe in chilled-water systems; except that 5” chilled water meters are acceptable.
 - 1. All piping & Fittings to be SEAMLESS or SMAW – NO ERW PIPING ALLOWED
- B. Drains and vents on chilled-water distribution piping shall consist of Schedule 80 thread-o-lets with bronze ball valves. Drain valves and air vents must be located such that any isolated section of the system can be properly drained and vented.
- C. Not Used
- D. All taps shall be constructed of appropriately sized Thread-o-Let or Weld-o-Let. Taps or branch connections using ½ couplings are not allowed NO EXCEPTIONS.
- E. Provide means for access where valves and fittings are not exposed.
- F. Chilled water systems serving secondary loads shall be independently circuited from the primary chilled water system within the building and serve mechanical systems such as standalone computer HVAC, refrigeration equipment, etc. Each loop shall be provided with independent circulating pump. Pump shall be located in easily accessible areas for service and not above ceiling. Secondary loads shall be consolidated into a minimum number of separate chilled water circulating loops. Aggregation of equipment on such loops shall be approved in advance by the University.
- G. Chilled water design supply water temperature shall be 42 °F, with a minimum return water temperature of 58 °F to maximize the usable lifetime (optimize pipe size of existing piping) of water systems. This shall be accomplished without the use of blending stations.

- H. Provide sectional valves on each branch and riser, close to main, where branch or riser serves 2 or more hydronic terminals or equipment connections. For Loop-Header systems isolation valves shall be located on either side of any lateral connection.
- I. Provide drain valves on each mechanical equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and at any low point required to completely drain hydronic-piping system.
- J. Provide high point vents/valves, and air pots at high points on lines.
- K. Route groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
- L. Select pumps on the ascending side of the efficiency curve. All pumps shall be non-overloading.
- M. In all cases, the PSP shall evaluate system conditions and select the optimum pump type and configuration based on efficiency, pump characteristics, and system curve.
 - 1. All pumps shall be floor mounted, with strainers installed and shall have isolation valves
- N. Provide pumps design to operate to 1,750 RPM unless directed otherwise.
- O. Provide pumps free of flashing and cavitation at all flow rates between 25% and 125% of design flow under the suction conditions of the pump installation.
- P. Provide pumps sized for critical speed of at least 115% of operating speed.
- Q. Provide base-mounted pumps on minimum of 4" high concrete base equal or greater than 3 times total weight of pump and motor, with anchor bolts poured in place. All pump bases shall be grouted in place with minimum 2" non-shrink-epoxy-grout pad.
- R. Provide manufacturer's recommended clearances as a minimum. Indicate on Drawings required access space around pumps for service.
- S. Design pipe changes off pumps using long radius reducing elbows or eccentric reducers to reduce and minimize turbulence. Provide piping support such that piping weight is not transferred to pump flanges or casing. Provide supports under elbows attached to inertia bases on pump suction and discharge.
- T. Use of expansion joints is discouraged, and shall not be used in the main chilled water piping loop or at primary building pump connections unless specific approval is granted from the Utilities Department at SHSU.
- U. Provide a minimum of five straight pipe diameters at pump inlet connections. Use of suction diffusers is discouraged and only allowed if space constraints require their use. Provide line size isolation valve and strainer on pump suction piping. Provide line sized, spring-loaded silent check valve and isolation valve on pump discharge piping.

PART 2: PRODUCTS

2.01 Piping:

- A. Pipe Size ½" (connections to fan coil units): Type "L" copper w/ wrought copper fittings.
- B. Pipe Size 2" and Smaller: Black steel pipe; Schedule 40; Class 150 malleable iron fittings with threaded joints.
- C. Pipe Size 2½" and Larger: Black steel pipe, Schedule 40, wrought-steel butt-welded fittings with welded joints. Mechanical/grooved fittings and couplings may be specified by the PSP.
- D. For main loop chilled water distribution piping (definition above), utilize the Utilities Department specifications for piping, valves, and fittings.
- E. No ERW piping shall be used on SHSU Campuses.
- F. All direct bury hydronic piping shall be HPDE NO EXCEPTIONS.

2.02 Piping Specialties:

- A. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish cast brass or sheet brass pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
- B. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for working pressure of the piping system, with type 304, stainless steel screens. Provide shut off valves to service strainers.
- C. Provide dielectric unions as recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.
- D. Sleeve Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.03 Pumps:

- 1. Aurora, Armstrong, Goulds, Peerless & Paco Chill water pumps preferred.

A. In-Line Circulator Pumps:

- 1. Provide maintenance free units design for the working pressure of the piping system and 225°F continuous water temperature.
- 2. Seals: Two piece mechanical ceramic seals.

3. Not Used
4. Shaft: Stainless steel.
5. Not Used
6. Coupling: Self-aligning, flexible coupling.
7. Impeller: Bronze or stainless steel enclosed type, hydraulically and dynamically balanced, and keyed to shaft.

B. Base-Mounted End Suction Pumps:

1. For primary building chilled water pumps, use the Utilities and Energy Management specifications for pumps and motors.
2. Provide horizontal base mounted, single stage, vertical split case, flexible coupling, designed for the working pressure of the piping system.
3. Casing: Ductile iron, ANSI flanges rated for the working pressure of the piping system and tappings for gauge and drain connections.
4. Shaft Sleeves: 316 Stainless Steel or Bronze with Buna O Ring Sealing between the impeller and the hub. Threaded to tighten when rotating in normal service direction.
5. Impeller Ring: Bronze. Easily replaceable.
6. Construction: Bronze fitted.
7. Seal: Two piece Mechanical Seal SiC or ceramic seal faces. Buna N elastomers.

C. Horizontal Split Case Pump:

1. For primary building chilled water pumps, use the Utilities and Energy Management specifications for pumps and motors.
2. Provide centrifugal, single stage, double volute base mounted, direct connected.
3. Casing: Ductile iron, ANSI flanges rated for the working pressure of the piping system, and tapping for gauge and drain connections.
4. Shaft: 300 series Stainless Steel.
5. Shaft Sleeves: 300 series Stainless Steel.
6. Not Used
7. Impeller: Bronze

8. Construction: Bronze fitted.
9. Seal: Two Piece Mechanical Seal SiC or ceramic seal faces.
10. Drive: Flexible coupling with coupling guard.
11. Baseplate: Steel.

D. Vertical Inline Pump (See restrictions above for use of this style pump):

1. Provide centrifugal, single stage, close coupled in-line, back pullout design.
2. Casing: Ductile iron, ANSI flanges rated for the working pressure of the piping system, and tapping for gauge and drain connections. Cast iron is allowed with approval of Utilities Power Plant Operations Associate Director.
3. Shaft: 316 or 400 series Stainless Steel.
4. Shaft Sleeves: 300 series Stainless Steel.
5. Not Used
6. Construction: Bronze fitted
7. Impeller Ring: Bronze, statically and dynamically balanced, and keyed to shaft.
8. Seal: Two Piece Mechanical Seal SiC or ceramic seal faces t.
9. Not Used

PART 3: EXECUTION

3.01 Installation

- A. Piping shall be installed plumb and square with the structure and walls in a good workmanship manner.
- B. Contractor shall provide Qualified Weld Procedures. Fusion field welding procedures shall include the following:
 1. Lo-Hi 6010 for stringer and hot pass.
 2. 7018 for the intermediate passes and the weld cap
 3. Contractor shall grind and clean between each pass
- C. Contract submittals shall include certified welding test no more than 6 months old at any time during the project.
- D. All pipe will be seamless or SMAW welded pipe, ERW pipe shall not be allowed on campus.

- E. Provide mill material specs on all pipe with heat numbers and Mill Test Reports (MTR).
- F. All welds will be done to ASME B31.1 standards
- G. All welds will done using E6010 for the stringer and hot pass. E7018 will be used for all intermediate and caps.
- H. All welds will be cleaned between each pass.
- I. SHSU reserves the right to inspect the welds (at our cost) by any means normally accepted in the industry including but not limited to; visual, dye-penetrant, mag-particle and radiograph. All weld inspections will use the procedures as outlined by the American Society for Non-Destructive Testing (ASNT).
- J. All welds that do not meet AMSE B31.1 standards will be repaired or removed and replaced at no additional cost to SHSU.
- K. Contractor shall provide WPS and PQR for the project.
- L. Contractor shall provide welding testing certificates for all welders no more than 6 months old.

END OF STANDARD