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 the main chilled water piping loop 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. UL Compliance: Design, manufacture, and install pumps in accordance with UL 778 "Motor Operated Water Pumps."

D. NEMA Compliance: Provide electric motors and components which comply with NEMA standards.

1.03 Requirements:

A. Avoid 3½” and 5” pipe in chilled-water systems; except that 5” chilled water meters are acceptable.

B. Drains and vents on chilled-water distribution piping shall consist of Schedule 80 thread-o-lets with stainless steel pipe nipples and bronze gate valves.

C. For chilled water distribution piping and pumps (main campus chilled water loop through the first valve on the discharge of the building pump), utilize the UT-Austin Utilities and Energy Management specifications for piping and pumps. Any deviations to these specifications must be approved by the Utilities Power Plant Associate Director.

D. All taps shall be constructed of 3/4” Schedule 80 Thread-o-Let, 3/4” 304/316 stainless steel nipples, and 3/4” bronze gate or full port ball valve with stainless steel ball and extended stem. Refer to Appendix 6.01.30 UT Standard CAD Detail M-23-4-31. (Utilities experience – if 2-piece ball valves used, ensure that SS bolts used.)

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.

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 and pump characteristics.

1. Recommend in-line circulating pumps or close-coupled end suction pumps for low flow (up to 50 GPM) secondary loop circulating systems. These style pumps shall not be used for the primary building pumps without specific approval from the Utilities Department at UT-Austin.

2. Recommend base-mounted end suction pumps for circulating systems with flow rates between 50 and 500 GPM.

3. Recommend horizontal split case, double-suction pumps for applications with flow rates exceeding 500 GPM.

4. Use of vertical in-line pumps is discouraged, and will be considered only on a case-by-case basis for applications with limited floor space and shall require approval by the Utilities Department at UT-Austin. If approved, a means for lifting the motor shall be designed and installed to allow maintenance on the pumps and motors.

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.

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 UT-Austin.

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.

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.

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:

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. Wetted surfaces shall be non-ferrous materials.
3. Body: Cast iron with bronze or stainless steel–fitted construction.
5. Motor: Non-overloading at any point on pump curve, open, drip-proof, oil-lubricated journal bearings, resilient mounted construction, built-in thermal overload protection on single phase motors.
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. Cast iron is allowed with approval of Utilities Power Plant Operations Associate Director. Shaft: Steel or stainless steel with replaceable shaft sleeve.
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.
7. Seal: Mechanical Seal with carbon vs 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, 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. Cast iron is allowed with approval of Utilities Power Plant Operations Associate Director. Shaft: 400 series or 300 series Stainless Steel.
4. Shaft Sleeves: Bronze, or 300 series Stainless Steel.
5. Motor: Non-overloading at any point on pump curve, open, drip-proof, oil-lubricated journal bearings, resilient mounted construction, built-in thermal overload protection on single phase motors.
6. Impeller: Bronze
7. Construction: Bronze fitted.
9. Seal: Mechanical Seal with carbon vs SiC or ceramic seal faces.

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: Bronze or 300 series Stainless Steel.
5. Motor: Non-overloading at any point on pump curve, open, drip-proof, oil-lubricated journal bearings, resilient mounted construction, built-in thermal overload protection on single phase motors.
6. Construction: Bronze fitted
7. Impeller Ring: Bronze, statically and dynamically balanced, and keyed to shaft.
8. Seal: Mechanical Seal with Carbon vs SiC or ceramic seal faces.

PART 3: EXECUTION

3.01 Pipe Testing Procedures:

A. Refer to 6.02.10 Appendix: Pipe Testing Procedures for hydronic pipe testing procedures.

END OF STANDARD