Design Standard

Interconnection of Building Hydronic Systems to Campus Thermal Utility Infrastructure

This standard defines requirements for connection of new facilities to existing thermal utility infrastructure as well as minimum clearances required between new facilities and existing infrastructure. For the purposes of this standard, thermal utility infrastructure includes underground chilled water and heating hot water lines owned and operated by Texas A&M University.

For campus buildings served by TAMU central thermal distribution systems, supply and return lines typically have piping with identical size and material for each system - chilled water (CHW), heating hot water (HHW), and domestic hot water (DHW). Because these thermal distribution lines are identical in size and appearance for each thermal system, there is the potential for cross-connection between supply and return. To avoid possible cross-connection of supply and return lines, design engineers shall require field verification in construction documents and contractors shall field verify the configuration of supply and return lines, using an appropriate temperature sensing device and adequate system flow, before making building connections. Any discrepancy between construction documents and field verification should be promptly reported to the project A/E and the Owner’s representative before completing piping installation, so proper piping configuration can be verified.

Detailed specifications follow.

PART 1 - GENERAL

1.01 THERMAL UTILITY INFRASTRUCTURE PROCESS CONDITIONS


B. The campus thermal distribution system static pressure will be set at 45 psig (104 ft.) and 50 psig (116 ft.) for West Campus and Main Campus, respectively. All buildings connected to the West and Main campus thermal distribution system shall assume these maximum static pressure values with direct connection. When the building hydronic system exceeds these static pressure values, an indirect connection is required.

PART 2 - CONNECTIONS TO EXISTING THERMAL UTILITY INFRASTRUCTURE

2.01 All new buildings to be constructed on the Texas A&M University Campus shall connect to existing thermal utility infrastructure. Any exceptions to this requirement must be approved in writing by the Utilities & Energy Services Department at Texas A&M before completion of the schematic design phase of the project.
2.02 The project is responsible for bearing all costs associated with the design and installation of thermal utility infrastructure connections.

2.03 Design and installation shall comply with the requirements of all applicable Utilities and Energy Services Design Standards. The complete set of design standards can be found at the following link: https://utilities.tamu.edu/design-standards/

2.04 BUILDING INTERCONNECTION

A. Direct Connection to Thermal Utility Infrastructure

1. The building hydronic system will direct connect to the thermal utility infrastructure.

2. The expansion and contraction of the volume of water in the building will be accounted for at the thermal utility plants. Expansion tanks shall not be permitted for building systems that are directly connected to the thermal utility infrastructure.

3. Existing buildings with aging equipment, piping, and HVAC systems designed for less than utility infrastructure process conditions shall not be direct connected to thermal utility infrastructure.

4. Direct Connection Building Hydronic Pumps:
   a. Each building will have one set of variable speed building hydronic pumps.
   b. The building hydronic pump speed will vary to provide the required hydronic differential pressure to ensure adequate building flows.

B. Direct Connection to Thermal Utility Infrastructure with Pressure Sustaining Valve

1. The campus thermal distribution system static pressure will be set at 45 psig (104 ft) and 50 psig (116 ft) for West and Main campus, respectively. All buildings connected to the West and Main campus thermal utility infrastructure shall assume these maximum static pressure values with direct connection. When the building hydronic system exceeds these static pressure values, a direct connection with pressure sustaining valves is required.

2. The pressure sustaining valve setpoint shall be set by the building hydronic system designer to maintain a static pressure equal to the highest hydronic coil within the building plus 5 psig.

3. The building hydronic system designer shall ensure that the static pressure is maintained in the highest hydronic coil and piping at all times.
4. Refer to Figure 1 Interconnection of Building Hydronic Systems to Campus Thermal Utility Infrastructure.

C. Indirect Connection to Thermal Utility Infrastructure

1. The building hydronic system will indirectly connect to the thermal utility infrastructure by way of a heat exchanger. A plate and frame heat exchanger will be utilized to pressure isolate the building hydronic system from the thermal utility infrastructure when:
   a. The building’s hydronic system pressure exceeds 45 psig (104 ft.) and 50 psig (116 ft.) for buildings on the West Campus and Main Campus, respectively, or
   b. The building’s HVAC system are designed with less than the thermal utility infrastructure process conditions, or
   c. The building’s hydronic piping system is aged and/or deteriorated such that it may cause piping leaks or thermal utility infrastructure contamination, or
   d. The building is owned or operated by a third party.

2. Plate and Frame Heat Exchanger:
   a. Select to maximize the thermal utility infrastructure temperature differential.
   b. The plate and frame heat exchanger shall be ASME stamped.

3. The building hydronic system will require provisions for expansion and contraction.

4. The building hydronic system will require provisions for makeup water including back-flow prevention and metering.

5. The interconnection of the building systems with the campus thermal utility infrastructure will require special attention to cleaning, pressure testing, filling, and flushing (Refer to Cleaning, Flushing, and Water Treatment).

6. Indirect Connection Building Hydronic Pumps:
   a. Each building will have one set of variable speed building hydronic pumps and one set of variable speed heat exchanger pumps.
   b. The building hydronic pump speed will vary to provide the required hydronic differential pressure to ensure adequate building hydronic flows.
   c. The heat exchanger pumps will be sized to meet the requirements of the heat exchanger and building hydronic system.

D. Common Requirements for all Building Interconnections

1. Installation shall comply with Texas A&M University’s Building Design Standards and Utilities & Energy Services’ Design Standards.
2. All buildings hydronic systems will be designed for variable flow, without bypass, to obtain maximum delta-T from the thermal utility infrastructure.


4. Building and Heat Exchanger Hydronic Pumps:
   a. Pumps shall be variable speed, centrifugal double-suction horizontal or vertical split case, single-stage, and direct-coupled.
   b. Pumps shall be provided with sufficient turn-down to account for minimum flow conditions.

5. Strainers:
   a. Construction and Start-up strainers shall be specified at a minimum of 40 mesh and are required on each pump.
   b. Permanent duty strainers shall not exceed 20 mesh.
   c. Permanent strainers shall be installed to protect pumps and plate and frame heat exchangers.

6. Air Removal:
   a. An air and dirt separator shall be provided for each building distribution system.
   b. Automatic air vents will be required at all high points in each system.
   c. Air vents shall have manual isolation valves to permit replacing a failed vent without shutting down the system.

7. Cleaning, Flushing, and Water Treatment:
   a. The engineer of record, in association with the commissioning agent (if applicable) and coordinated with Utilities and Energy Services, shall develop an inspection, flush, and startup plan.
   b. Each contractor shall flush, fill, and treat their system before being connected to the thermal utility infrastructure.
   c. The initial filling of the building hydronic system from the thermal utility infrastructure shall be done in a manner to prevent damage to the Thermal Utility Plant equipment and/or contaminate or introduce air to thermal utility infrastructure.
   d. Each contractor shall install all bypasses necessary for flushing. The contractor shall also remove all bypasses to a permanent configuration when flushing is complete.
   e. For initial building hydronic start-up, the system shall be pumped by building hydronic pumps for flushing.
   f. After start-up, all thermal utility infrastructure water chemistry and make-up shall be controlled at the Thermal Utility Plants for direct connections. Alternatively, for indirect connections, the building hydronic chemistry and makeup shall be controlled by the building facilities staff.
g. Utilities & Energy Services will sign-off on the water chemistry before any valves are opened to the thermal utility infrastructure.


E. Commissioning

1. Definition by ASHRAE as a systematic process of ensuring that systems are designed, installed, functionally tested, and capable of being operated and maintained to perform in conformity with the design intent.

2. Building commissioning shall be provided:
   a. To ensure that the building hydronic systems are designed and function in accordance with this Standard.
   b. Initial filling of the building system shall be metered to obtain a total building system hydronic volume. Document and submit this total water volume to the project’s Commissioning Agent.
   c. By an independent third party hired by the University.

PART 3 - MINIMUM CLEARANCE REQUIREMENTS

3.01 No structures or facilities are to be built or placed underneath or on top of existing thermal utility lines or easements.

3.02 The project is required to maintain a minimum clearance of 8 feet from the closest point of any existing underground thermal utility infrastructure.

3.03 The project shall bear all costs associated with thermal utility infrastructure modifications required to maintain minimum clearances defined above.

3.04 Assistance in locating existing thermal utility infrastructure on a proposed project site can be obtained from the Technical Services group at Utilities and Energy Services at 979-862-4604.
APPENDIX A

INTERCONNECTION OF BUILDING HYDRONIC SYSTEMS TO CAMPUS THERMAL UTILITY INFRASTRUCTURE
Appendix A

Interconnection of Building Hydronic Systems to Campus Thermal Utility Infrastructure

CAMPUS DIRECT CONNECTION TO BUILDING HYDRONIC SYSTEMS

NOTES:
1. AIR/DIRT SEPARATOR REFER TO DETAILS.
2. BUILDING PUMPS REFER TO DETAILS.
3. PRESSURE SUSTAINING VALVE, THE CAMPUS THERMAL DISTRIBUTION SYSTEM STATIC PRESSURE WILL BE SET AT 45 psig (104 ft) AND 50 psig (166 ft) FOR WEST AND MAIN CAMPUS RESPECTIVELY, ALL BUILDING CONNECTED TO THE WEST AND MAIN CAMPUS THERMAL UTILITY INFRASTRUCTURE SHALL ASSUME THESE MAXIMUM STATIC PRESSURE VALUES WITH DIRECT CONNECTION. WHEN THE BUILDING HYDRONIC SYSTEM EXCEEDS THESE STATIC PRESSURE VALUES, A DIRECT CONNECTION WITH PRESSURE SUSTAINING VALVE IS REQUIRED.

CAMPUS INDIRECT CONNECTION TO BUILDING HYDRONIC SYSTEMS

NOTES:
1. AIR/DIRT SEPARATOR REFER TO DETAILS.
2. BUILDING PUMPS REFER TO DETAILS.
3. HEAT EXCHANGER PUMPS REFER TO DETAILS.
4. THE BUILDING HYDRONIC SYSTEM WILL INDIRECTLY CONNECT TO THE THERMAL UTILITY INFRASTRUCTURE BY WAY OF A HEAT EXCHANGER. A PLATE AND FRAME HEAT EXCHANGER WILL BE UTILIZED TO PRESSURE ISOLATE THE BUILDING HYDRONIC SYSTEM FROM THE THERMAL UTILITY INFRASTRUCTURE WHEN:
A. THE BUILDING'S HYDRONIC SYSTEM PRESSURE EXCEEDS 45 psig (104 ft) AND 50 psig (166 ft) FOR BUILDINGS ON THE WEST CAMPUS AND MAIN CAMPUS, RESPECTIVELY, OR
B. THE BUILDING'S HYDRONIC SYSTEM IS DESIGNED FOR LESS THAN THE THERMAL UTILITY INFRASTRUCTURE PRESSURE CONDITIONS, OR
C. THE BUILDING'S HYDRONIC PIPING SYSTEM IS AGED AND/OR DETERIORATED SUCH THAT IT MAY CAUSE PIPING LEAKS OR THERMAL UTILITY INFRASTRUCTURE CONTAMINATION.
Appendix A
Interconnection of Building Hydronic Systems to Campus Thermal Utility Infrastructure

TYPICAL BUILDING HYDRONIC RISER DIAGRAM
SCALE: NONE

NOTES:
1. AUTOMATIC AIR VENTS PIPED TO FLOOR DRAINS. REFER TO DETAILS.
2. WATER PIPING CONNECTIONS TO COILS IN AIR HANDLING UNITS. REFER TO DETAILS.
APPENDIX B

BUILDING HYDRONIC SYSTEM DETAILS
Appendix B
Building Hydronic System Details

AUTOMATIC AIR VENT (AV) DETAIL

NOTES:
1. PROVIDE HOSE ADAPTER FITTING AND HOSE CONNECTOR VACUUM BREAKER FOR VENTS LOCATED IN FINISHED SPACES OR WHERE INDICATED.

2. EXTEND VENT TO DRAIN WITH MINIMUM OF 2" AIR GAP IN ACCORDANCE WITH LOCAL PLUMBING CODE IN MECHANICAL ROOMS AND UNFINISHED AREAS.

AIR/DIRT SEPARATOR DETAIL

NOTES:
1. PROVIDE VALVE TYPES AS SPECIFIED FOR FLUID SERVICE.
2. PROVIDE LOCKABLE VALVE. LOCK VALVE IN OPEN POSITION.
3. PROVIDE SPIROVENT DIRT OR APPROVED EQUAL.
**NOTES:**

1. PROVIDE VALVE TYPES AS INDICATED IN SPECIFICATION FOR FLUID SERVICES BEING PUMPED.

2. SUPPORT PUMP AS REQUIRED BY MANUFACTURER AND SPECIFIED. PUMP SUPPORT SHALL ELIMINATE STRESS ON PUMP COMPONENTS AND SHALL ALLOW FOR PIPE EXPANSION.
WATER PIPING CONNECTIONS TO COILS IN AIR HANDLING UNITS

NOTES:
1. PROVIDE VALVE TYPES AS SPECIFIED FOR FLUID SERVICE INDICATED.
2. DRAINS AND VENTS SHALL NOT BE COMBINED TOGETHER.
Appendix B
Building Hydronic System Details

BASE MOUNTED END SUCTION PUMP PIPING DETAIL
NO SCALE

NOTES:

1. PROVIDE VALVE TYPES AS INDICATED IN SPECIFICATION FOR FLUID SERVICES BEING PUMPED.

2. AT CONTRACTOR’S OPTION PROVIDE 5 DIAMETERS STRAIGHT SUCTION PIPE IN LIEU OF SUCTION DIFFUSER.

3. IF SUCTION DIFFUSER DOES NOT INCLUDE SUPPORT ON SUCTION DIFFUSER, PROVIDE ADDITIONAL PIPE SUPPORT.
DOUBLE SUCTION SPLIT CASE PUMP PIPING DETAIL

NO SCALE

NOTES:
1. PROVIDE VALVE TYPES AS INDICATED IN SPECIFICATION FOR FLUID SERVICES BEING PUMPED.