PART 1 - INTRODUCTION

1.1 PURPOSE

This section contains the design criteria for exterior chilled water distribution systems. Section 15 11 00: Valves contains the design criteria for valves. Section 15 18 10: Hydronic Piping contains the design criteria for internal chilled water system piping.

PART 2 - GENERAL DESIGN REQUIREMENTS

2.1 SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS

Design all cathodic protection systems in collaboration with Yale University's corrosion protection consultant.

2.2 SUBMITTALS

Submit the following design and construction documents to Yale University.

A. Design Documents

1. Plan and profile views of all design drawings
2. Piping system analysis (The piping system manufacturer must analyze the piping system layout to determine pipe stresses and displacements.)

B. Construction Documents

1. Copies of welding certificates

2.3 PRODUCT STANDARDS

A. All work must conform to ASME standards.

B. Thrust blocking must conform to AWWA standards.

2.4 MANUFACTURERS

Subject to compliance with the design requirements, use POLY-THERM chilled water lines manufactured by PERMA-PIPE, or chill-therm as manufactured by Thermacor Process, L.P. or an approved equivalent, when placing lines underground.

2.5 MATERIALS

A. All internal piping must be standard weight, ASTM A53, Grade B, ERW carbon steel for Derm-Pipe

product and SDR-25 PVC for chill-therm product.

B. All elbows, tees, reducers, anchors, field joints, and end seals must be designed and factory fabricated to prevent the ingress of moisture into the system.

C. Pipe insulation must be polyurethane foam with the following characteristics:

1. 2 lb/ft3 minimum density
2. 90% minimum closed cell content
3. 40 psi minimum compressive strength
4. 0.18 Btu-in/hr/ft2/°F initial thermal conductivity

D. All straight sections of pipe must be wrapped with a filament-wound, polyester resin or fiberglass-reinforced composite applied directly on the insulating foam.

E. Manufacturer must furnish all field joint insulation and jacketing materials.

2.6 ACCESSORIES OR SPECIAL FEATURES

A. Vents and drains must be ball valve type. Shut-off duty valves must be butterfly type.

B. Place identification ribbon above the centerline of the pipes at a depth of 18" below grade.

2.7 SPECIAL REQUIREMENTS

Install manual air vents at high points in the piping and elsewhere, as required, for system air venting.

2.8 PREPARATION

A. Where possible, place straight, 40' lengths of pipe with the piping exposed at each end for field joint fabrication.

B. All fittings for insulation must be prefabricated to minimize field joints and jacketed in a chopped, spray-up plastic resin/fiberglass reinforcement composite. Apply the composite directly onto the insulating foam to a thickness related to the filament wound jacket thickness.

C. Bury piping at a depth of 4' to 8'.

2.9 INSTALLATION GUIDELINES

A. Pour insulation in place into all field joint areas.

B. Do not backfill until field joint areas, with heat-shrinkable adhesive-backed sleeves, have cooled.

C. All straight sections of insulated pipe must be filament wound, with plastic resin/fiberglass reinforcement composite applied directly on the insulating foam.

D. Where possible, provide a uniform pipe bedding of suitable on-site material. If suitable material is not available, backfill the trench with sand. Using a material similar to the bedding, backfill the entire trench width evenly in 6" lifts to 6" above the top of the pipe. Compact the lifts to at least a 95% Standard Proctor density, meeting ASTM D1556 standards at optimum moisture (or as recommended by the soils engineer). Backfill the remaining trench in lifts not to exceed 12" up to the sub-grade height for the surface condition encountered. Compact the lifts to a 95% Standard Proctor density, meeting ASTM D1556 standards at optimum moisture (or as recommended by the soils engineer). Backfilling and compacting above the subgrade must be determined by the soils engineer or by the recommended paving design for the project.

2.10 QUALITY CONTROL

Work on chilled water distribution systems must conform to the following quality control standards.

A. Testing Laboratory: Yale University will retain the services of a qualified, independent testing laboratory to x-ray 10% to 15% of all welded joints. The contractor must hire a testing agency, at their expense, to x-ray all welds.

B. Testing Methodology and Extent: Hydrostatically test piping to 150 psig or 1.5 times the design pressures, whichever is greater.

2.11 CLEANING AND ADJUSTING

A. After hydrostatic testing, and before operational testing, thoroughly clean piping with a caustic soda, trisodium phosphate, or equivalent chemical cleaner. Thoroughly flush chilled water piping systems with clean water.

B. The contractor is responsible for chemical treatments using Yale University’s chemical treatment provider.

2.12 STARTUP AND TRAINING

A. All water drained from the distribution system during testing and tie-ins must be drained to the sanitary sewer, not the storm sewer.

B. Before project completion, the contractor must walk the site with the design professional and Yale University staff to verify the location of all valves and air vents.

Date	Description of Change	Pages / Sections Modified	ID
11/27/23	Template update	-	Office of Facilities