SECTION 15050

PIPE & PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, support, and test pipe and pipe fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere:
   1. Excavation and backfill are specified in Division 2.
   2. Concrete encasements are specified in Division 3.
   3. Painting and Pipe Identification are specified in Section 09900.
   4. Surface Preparation and Shop Coatings are specified in Section 09905.
   5. Valves, gates, pipe hangers, pipe supports, pipe and equipment insulation, heating, and plumbing are specified in the appropriate Sections in Division 15.
   6. Pipe materials are specified in the appropriate sections of Division 15.

C. Other Trades: Cooperate with all other trades whose work is to be coordinated with piping work.

1.2 REFERENCES

A. American National Standards Institute (ANSI)
   1. ANSI B31.3 – Process Piping
   2. ANSI B31.9 – Building Services Piping

1.3 SUBMITTALS

A. Submit shop drawings in accordance with Section 01340 and the General Conditions of the Construction Contract.

B. Submit manufacturer's "Certification of Conformance" that pipe and fittings and other piping appurtenances meet or exceed the requirements of these Specifications.

C. Submit other documents as specified in the appropriate Sections of this Division.

D. Submit complete pipe support system design stamped by a Professional Engineer registered in the State of Maine with at least 5 years of experience in the analysis and design of similar system within the last 5 years.

E. Computerized calculations with supporting and backup documentation will be acceptable.

F. The design of the pipe support system shall include analyzing the system piping and service conditions to develop a detailed support system, specific to the piping material, pipe joints, valves and piping appurtenances.

G. The support system design shall include the criteria for each piping system.

H. The piping system analysis and design shall conform to ANSI B31.

I. The support system shall be designed for dead weight and dynamic analysis, including system thermal effects and pressure thrusts.

1. Each piping system shall be presented in an isometric graphic and shall show the resolved and resultant force and moment systems as well as all recommended hangers, supports, anchors, restraints and expansion/flexible joints.

J. Submit complete layouts, schedules, and location plans for all piping systems.

K. Submit complete piping drawings for each piping submittal indicating type of hanger and/or support, location, magnitude of load transmitted to the structure and type of anchor, guide and other pipe supporting appurtenances including structural fasteners.

L. Submittal shall include catalog cut for each different type of pipe hanger or support indicating the materials of construction, dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers and/or supports are not suitable, submit detailed drawings showing materials and details of construction for each type of special anchor and/or support.

M. Summary of Contractor selected related components including joints, class, valves, appurtenances, etc., and commercial supports and piping materials.

N. Coordinate piping support arrangements to eliminate interference with similar systems to be installed under HVAC, Plumbing, Fire Protection and Electrical; to account for structural expansion joints and to maintain access for both personnel and for removal of equipment.

O. After the work is installed, but before it is filled for start-up and testing, the support system design engineer shall inspect the work and certify its complete adequacy. Each system shall be inspected and certified in the same way. Submit a report, including all field modifications and all certificates.

1.4 DELIVERY, STORAGE AND HANDLING

A. Exercise care during loading, transporting, unloading, and handling to prevent damage of any nature to interior and exterior surfaces of pipe and fittings.

B. Do not drop pipe and fittings.

C. Store materials on the project site in enclosures or under protective coverings in accordance with manufacturer's recommendations and as required by the Engineer.

D. Assure that materials are kept clean and dry.

E. Do not store materials directly on the ground.

F. Follow manufacturer's specific instructions, recommendations and requirements.

G. Store in a manner to protect items with epoxy shop coatings from exposure to UV light which can cause chalking of the epoxy. Length of acceptable exposure prior to providing UV protective measures shall be in accordance with coating manufacturer’s recommendations. This includes protection from UV light after installation while awaiting covering or filling of tanks, or prior to field painting for items scheduled to be topcoated as specified in Section 09900.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials are specified in the following Sections in this Division.

2.2 SURFACE PREPARATION AND SHOP COATINGS

A. Provide surface preparation and shop coatings in accordance with Specification Section 09905.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
B. Carefully inspect all materials at the time of delivery and just prior to installation.
C. Carefully inspect all pipe and fittings for:
    1. Defects and damage.
    2. Deviations beyond allowable tolerances for joint dimensions.
    3. Removal of debris and foreign matter.
D. Examine areas and structures to receive piping for:
    1. Defects, such as weak structural components that adversely affect the execution and quality of work.
    2. Deviations beyond allowable tolerances for pipe clearances.
E. All materials and methods not meeting the requirements of this Contract will be rejected.
F. Immediately remove all rejected materials from the project site.
G. Start work only when conditions are corrected to the satisfaction of the Engineer.

3.2 INSTALLATION

A. General:
    1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations and as specified herein.
    2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
    3. Install adapters, acceptable to the Engineer, when connecting pipes constructed from different materials.
    4. Support all piping not being installed in trenches in accordance with the "Pipe Hangers & Supports" Section in Division 15.
B. Installation in Trenches:
    1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
    2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
    3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
    4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
    5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.
    6. Set the pipe true to line and grade.

7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
8. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.
9. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
10. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
11. Take all necessary precautions to prevent floatation of the pipe in the trench.
12. Bedding and backfill for all pipe materials shall be as specified in Section 02200, Earthwork, and as shown on the Drawings.

C. Temporary Plugs:
1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
3. Do not use the pipelines as conductors for trench drainage during construction.

3.3 CLEANING AND TESTING

A. Cleaning & Testing Piping - General:
1. Thoroughly clean all piping prior to testing. Remove all dirt, dust, oil, grease and other foreign material. Exercise care while cleaning to avoid damage to linings and coatings.
2. When the installation is complete, test all pipelines in the presence of the Engineer and the plumbing or building inspector in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications, at no additional cost to the Owner. When requested by the Engineer or local plumbing inspector, building gravity drains shall be tested prior to backfilling or concealing. All other piping must be tested after backfilling.
3. Equipment: Supply all labor, equipment, materials, taps, gages, and pumps required to conduct the tests.
4. Retesting: Perform all retesting required by the Engineer at no additional cost to the Owner.

B. Potable Water Piping:
1. Disinfection of Pipelines:
   a. Chlorinate all new potable water lines in accordance with the procedure outlined in AWWA C651. (Section 5.1 deleted)
   b. Review locations of chlorination and sampling points with the Engineer prior to beginning disinfection.
   c. Use a dosage which will produce an initial minimum concentration of 25 mg/l and not less than 10 mg/l chlorine residual after a contact period of 24 hours.
   d. During the chlorination period, exercise care to prevent the contamination of water in the existing water main.

e. After chlorination, flush the piping with clean potable water until the residual is that prevailing in the existing system or less than 0.5 mg/l.
f. The Contractor shall furnish and install corporation stops, taps, lengths of pipe as required to conduct testing.
g. Dispose of chlorinated water as per AWWA C651, Appendix B.

2. Bacteriological Testing:
   a. Test all new potable water lines for total coliform bacteria at no additional cost to the Owner.
   b. The length of pipe to be tested and the time of the test itself shall be as approved in advance by the Engineer.
   c. The Engineer will observe the taking of samples.
   d. Have all samples tested by a laboratory certified by the State and submit test results to the Engineer.
   e. Any segment of a potable water line shall be considered unsuitable for service if a coliform bacteria count is obtained from that sample or if results show a high non-specific bacteria level.
   f. Re-disinfect all segments of piping considered unsuitable and retest. Continue to disinfect and test until satisfactory results are obtained.
   g. Place piping into service when it has been successfully tested for pressure, leakage and total coliform bacteria and has been accepted by the Engineer.

C. Building Interior Water Lines: Clean and test in accordance with the "Plumbing General" Section in Division 15.

D. All Other Piping Systems:
   1. Pressure Test:
      a. The section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If blowoffs are not available at high points for releasing air the Contractor shall make the necessary excavations, backfilling and taps at such points and shall plug said holes after completion of the test.
      b. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
      c. Perform pressure and leakage test at the test pressure shown on the Pipe Schedule. If no test pressure is indicated, perform pressure and leakage test at 1-½ times the maximum system pressure or 100 psi which ever is greater (based on the elevation of the lowest point of the section under test and corrected to the gage location).
      d. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two-hour period on buried pipelines exceeds a rate of 10 gallons per inch of diameter per 24 hours per mile of pipeline the section shall be considered as having failed the test. All pipes within structures and chambers and all flanged joints shall have no visible leakage.
      f. If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without

extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.

2. Connection to Work by Others.
   a. If work involves connection of pipe lines to pipes or structures provided by others, pressure tests pipe line prior to making the connection.
   b. After successfully passing the pipe line pressure test, make the necessary connections to the work by others, and pressure test the connection.
   c. The connection shall be pressurized to the pipe line test pressure, for a minimum of 4 hours. The connection shall have no visible leakage.
   d. Correct any leakage at no cost to the Owner and retest until connection passes.
3. Cleaning: Perform all specialized cleaning as specified or required by system.

3.4 PIPE SCHEDULE -

SYMBOL	DESCRIPTION	LOCATION(1)	SIZE RESTRICTIONS	MATERIAL	JOINT SYSTEM
HYP, DEC, Chemical Fill, Suction Header, Overflow, Tank Drain, Vent	SODIUM HYPOCHLORITE & SODIUM BISULFITE CHEMICAL LINES	INTERIOR		SCH 80 PVC	SOLVENT WELD
		DOUBLE WALLED CONTAINMENT PIPE (4)		SCH 40 WITH LONG RADIUS SWEEPS	SOLVENT WELD
H	HEAT	EXTERIOR (SEE SPEC SECTION 15189)			
		INTERIOR (SEE SPEC SECTION 15601)			
CW	CARRIER WATER	EXTERIOR	4" & LARGER	CLASS 52 D.I.	PUSH-ON
			LESS THAN 4"	SCH 80 PVC OR	SOLVENT WELD
		INTERIOR	3" & LARGER	CLASS 53 D.I. (2)	FLANGED
			LESS THAN 3"	SCH 80 PVC OR	SOLVENT WELD
				TYPE L COPPER	SOLDERED
Tubing	Chemical and Sample Lines	See Specification 15065-Chemical Feed and Sample Systems Piping			
	PIPE CONDUIT	EXTERIOR		SDR 35 PVC	PUSH-ON
W	CITY WATER	EXTERIOR	4" & LARGER	CLASS 52 D.I.	PUSH-ON
			LESS THAN 4"	SCH 80 PVC OR	SOLVENT WELD
		INTERIOR	(SEE SPEC SECTION 15401)		

(1) PIPE CONTAINED WITHIN TANKAGE SHALL BE CONSIDERED “INTERIOR” PIPING FOR THE PURPOSES OF THE PIPE SCHEDULE (UNLESS OTHERWISE SPECIFICALLY DESIGNATED).
(2) TYPE L COPPER MAY BE USED IN LIEU OF D.I. FOR 3" DUCTILE IRON PIPE.
(3) IF A SPECIFIC PRESSURE IS NOT INDICATED IN PARENTHESES AFTER THE PRESSURE TESTING CLASS, USE THE TEST PRESSURE INDICATED IN THE SPECIFICATION WRITE UP FOR THAT GENERAL PIPE PRESSURE TESTING CLASS.
(4) REFER TO THE DRAWINGS WHERE CHEMICAL FEED PIPING REQUIRES DOUBLE WALLED CONTAINMENT. ALSO REFER TO SPECIFICATION SECTION 15065 - CHEMICAL FEED AND SAMPLE SYSTEMS.

END OF SECTION