SECTION 400539.13 - CONCRETE PRESSURE WATER PIPE

Note that this section has only been edited for NYSOGS standardization and has not been technically edited. The designer shall make all technical edits specific to the project for this section.

This Section specifies concrete pipe materials and appurtenances normally encountered with pressurized water piping within a water treatment plant.

Valves are specified elsewhere in Division 40.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Concrete pipe and fittings for pressurized water lines.

Bedding and cover materials.

* + - * 1. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 330110.58 - Disinfection of Water Utility Piping Systems: Disinfection of water mains and appurtenances.

Section 330507 - Trenchless Installation of Utility Piping: Waterline installation under roadways and other obstructions.

Section 330509.33 - Thrust Restraint for Utility Piping: Tied joint restraint system to anchor and resist forces developed in underground closed pipeline systems.

Section 330597 - Identification and Signage for Utilities: Pipe markers.

Section 400578.11 - Air Release Valves for Water Service: Air release valves at pipeline high points.

* + - 1. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

LEED requires compliance with specific editions of referenced standards..

* + - * 1. American Association of State Highway and Transportation Officials:

AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 10-lb Rammer and a 18-in. Drop.

* + - * 1. American Water Works Association:

AWWA C300 - Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.

AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.

AWWA C302 - Reinforced Concrete Pressure Pipe, Noncylinder Type.

AWWA C303 - Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.

AWWA C304 - Standard for Design of Prestressed Concrete Cylinder Pipe.

AWWA M9 - Concrete Pressure Pipe.

* + - * 1. ASTM International:

ASTM A648 - Standard Specification for Steel Wire, Hard-Drawn for Prestressed Concrete Pipe.

ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.

ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.

ASTM C505 - Standard Specification for Nonreinforced Concrete Irrigation Pipe with Rubber Gasket Joints.

ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3).

ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).

ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

* + - * 1. NSF International:

NSF 61 - Drinking Water System Components - Health Effects.

NSF 372 - Drinking Water System Components - Lead Content.

* + - 1. PREINSTALLATION MEETINGS
				1. Convene minimum [**one week**] [**<\_\_\_\_\_\_\_\_> weeks**] prior to commencing Work of this Section.
			2. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: Submit manufacturer information regarding piping details, appurtenances[**, and**] <**\_\_\_\_\_\_\_\_**>.

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for concrete pipe within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

* + - * 1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

Include separate Paragraphs for additional certifications.

* + - * 1. Test and Evaluation Reports:

Steel: Physical and chemical properties.

Rubber for Gaskets: Physical properties.

* + - * 1. Source Quality-Control Submittals: Indicate results of [**shop**] [**factory**] tests and inspections.
				2. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
				3. Qualifications Statement:

Coordinate following Subparagraph with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer and installer.

* + - 1. SUSTAINABLE DESIGN SUBMITTALS
				1. Manufacturer's Certificate:

Certify that products meet or exceed specified sustainable design requirements.

Insert material certifications list below to suit products specified in this Section and Project sustainable design requirements. Specific certificate submittal and supporting data requirements are specified in Section 018113.

Materials Resources Certificates:

Certify source and origin for [**salvaged**] [**and**] [**reused**] products.

Certify recycled material content for recycled content products.

Certify source for regional materials and distance from Project Site.

* + - * 1. Product Cost Data:

Submit cost of products to verify compliance with Project sustainable design requirements.

Exclude cost of labor and equipment to install products.

Provide cost data for following products:

Edit list of material cost data below to suit products specified in this Section and Project sustainable design requirements. Specific cost data requirements are specified in Section 018113.

Salvaged, refurbished, and reused products.

Products with recycled material content.

Regional products.

<**\_\_\_\_\_\_\_\_**>.

* + - 1. CLOSEOUT SUBMITTALS
				1. Project Record Documents: Record actual locations of piping, connections, thrust restraints, including [**invert**] [**centerline**] elevations.
			2. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

* + - * 1. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.
				2. Marking of Pipe:

Comply with AWWA C302.

Indicate name or trademark of manufacturer, and date of manufacture.

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform Work according to <**\_\_\_\_\_\_\_\_**> standards.

Include following Paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain <**\_\_\_\_\_\_\_\_**> [**copy**] [**copies**] of each standard affecting Work of this Section on Site.
			1. QUALIFICATIONS

Coordinate following Paragraphs with requirements specified in SUBMITTALS Article.

* + - * 1. Manufacturer: Company specializing in manufacturing products specified in this Section with [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
				2. Installer: Company specializing in performing Work of this Section with [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
			1. DELIVERY, STORAGE, AND HANDLING
				1. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
				2. Storage:

Store materials according to manufacturer instructions.

Block individual and stockpiled pipe lengths to prevent moving.

* + - * 1. Protection:

Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

Provide additional protection according to manufacturer instructions.

* + - 1. EXISTING CONDITIONS
				1. Field Measurements:

Verify field measurements prior to fabrication.

Indicate field measurements on Shop Drawings.

1. PRODUCTS
	* + 1. CONCRETE WATER PIPE

Pipe specified in following Paragraph is typically used for transmission lines in irrigation, for industrial and domestic water supply systems, and for distribution feeder mains.

* + - * 1. Reinforced Concrete Pressure Pipe, Steel-Cylinder Type:

Pipe and Fittings: Comply with AWWA C300.

Performance and Design Criteria: Comply with [**ASTM C497**] [**and**] [**AWWA M9**].

Joints: [**Bell and spigot**] [**Double spigot and sleeve**] with single rubber gasket.

Coating and Lining: Comply with AWWA C300.

Pipe specified in following Paragraph is usually limited to maximum working pressure of 55 psig, and is typically used for systems such as low-pressure transmission lines in irrigation, and for industrial and domestic water supply systems.

* + - * 1. Reinforced Concrete Pressure Pipe, Non-Cylinder Type:

Comply with AWWA C302.

Performance and Design Criteria: Comply with [**ASTM C497** ] [**and**] [**AWWA M9**].

Joints: [**Bell and spigot**] [**Double spigot and sleeve**] with single rubber gasket.

Coating and Lining: Comply with AWWA C302.

Pipe specified in following Paragraph is typically used for transmission mains, for distribution feeder mains, for pressure siphons, for penstocks, for industrial pressure lines, and for water intake lines.

* + - * 1. Prestressed Concrete Pressure Pipe, Steel-Cylinder Type:

Pipe and Fittings: Comply with AWWA C301 [**and ASTM A648**].

Performance and Design Criteria: Comply with [**ASTM C497 ,**] AWWA C304 [**, and**] [**AWWA M9**].

Joints: [**Bell and spigot**] [**Double spigot and sleeve**] with single rubber gasket.

Coating and Lining: Comply with AWWA C301.

Pipe specified in following Paragraph is typically used for cross-country transmission mains, for distribution feeder mains, and for water treatment plants.

* + - * 1. Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type:

Pipe and Fittings: Comply with AWWA C303.

Performance and Design Criteria: Comply with [**ASTM C497** ] [**and**] [**AWWA M9**].

Joints: [**Bell and spigot**] [**Double spigot and sleeve**] with single rubber gasket.

Coating and Lining: Comply with AWWA C303.

* + - * 1. Concrete Low-Head Pressure Pipe:

Pipe in following Subparagraph is limited to applications where internal hydrostatic head does not exceed 125 feet.

Reinforced Type: Comply with ASTM C361.

Nonreinforced Type: Comply with ASTM C505.

* + - 1. SUSTAINABILITY CHARACTERISTICS

Insert sustainable design characteristics in this Article to suit content of this Section and Project sustainable design requirements specified in Section 018113.

* + - * 1. Material and Resource Characteristics:

Recycled Content Materials: Furnish materials with maximum available recycled content [**including:**] [**.**]

Insert list of materials specified in this Section required to have recycled content.

<**\_\_\_\_\_\_\_\_**>.

Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project Site [**including:**] [**.**]

Insert list of materials specified in this Section required to be regional materials.

<**\_\_\_\_\_\_\_\_**>.

* + - 1. MATERIALS

Select bedding and cover material type for Project conditions. If more than one type is required, edit following Paragraph. Bedding and Cover:

* + - * 1. Soil Backfill from above Pipe to Finish Grade:

**[Subsoil with no rocks more than 6 inches in diameter, frozen earth, or foreign matter.]**

* + - 1. ACCESSORIES
				1. Thrust Restraints: As specified in Section 330509.33 - Thrust Restraint for Utility Piping.
				2. Air Release Valves:

As located on Drawings.

As specified in Section 400578.11 - Air Release Valves for Water Service.

* + - * 1. Pipe Markers: As specified in Section 330597 - Identification and Signage for Utilities.
			1. SOURCE QUALITY CONTROL
				1. Testing:

Cylinder Welds: Comply with AWWA [**C300**] [**C301**] [**C303**].

Lining and Coating: Comply with AWWA [**C300**] [**C301**] [**C302**] [**C303**].

Hydrostatic Pressure:

Scope: Pipes and joints.

Comply with AWWA [**C300**] [**C301**] [**C302**] [**C303**].

Number of Pipe Sections Tested: Not more than 1 percent of total number of sections of each size and class; minimum one test of each size and class of pipe.

D-Load Tests:

Comply with ASTM C497

Number of Pipe Sections Tested: Not more than 1 percent of total number of sections of each size and class; minimum three pipe sections and one test of each size and class of pipe.

Include one or both of following Paragraphs to require Director’s inspection or witnessing of test at factory.

* + - * 1. Director’s Inspection:

Make completed <**product name**> available for inspection at manufacturer's factory prior to packaging for shipment.

Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspection is allowed.

* + - * 1. Director’s Witnessing:

Allow witnessing of factory inspections and tests at manufacturer's test facility.

Notify Director’s Representative at least [**seven**] <**\_\_\_\_\_\_\_\_**> days before inspections and tests are scheduled.

Include following Paragraph if reliance on manufacturer's approved quality-control program is sufficient for Project requirements.

* + - * 1. Certificate of Compliance:

If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

Specified shop tests are not required for Work performed by approved manufacturer.

1. EXECUTION
	* + 1. EXAMINATION
				1. Verify that existing utility water main size, location, and [**invert**] [**centerline**] elevations are as indicated on [**Shop**] Drawings.
			2. PREPARATION
				1. Pipe Cutting: Cut pipe ends square, using only equipment specifically designed for pipe cutting.
				2. Remove dirt on inside and outside before assembly.
			3. INSTALLATION
				1. Bedding:

Excavation:

Hand trim for accurate placement of pipe to elevations as indicated on Drawings.

Dewater excavations to maintain dry conditions and to preserve final grades at bottom of excavation.

Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding [**6**] [**8**] <**\_\_\_\_\_\_\_\_**>-inch compacted depth, and compact to [**95**] <**\_\_\_\_\_\_\_\_**> percent of maximum density.

* + - * 1. Piping:

Comply with AWWA [**C300**] [**C301**] [**C302**] [**C303**].

Handle and assemble pipe according to manufacturer instructions [**and as indicated on Drawings**].

Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel before backfilling.

Maintain [**10**] <**\_\_\_\_\_\_\_\_**> feet of horizontal separation between water main and [**sewer**] <**\_\_\_\_\_\_\_\_**> piping [**according to <\_\_\_\_\_\_\_\_> code**].

Pipes Smaller Than 24 Inches:

Before inserting spigot into bell, apply mortar to bell consisting of one part nonshrink, nonmetallic cement to two parts sand.

Remove excess mortar after insertion.

Pipes Larger Than 24 Inches:[**After backfilling,**] point joints on inside with mortar consisting of one part nonshrink, nonmetallic cement to two parts sand.

Route pipe in straight line, and re-lay pipe that is out of alignment or grade.

High Points:

Install pipe with no high points.

If unforeseen field conditions arise that necessitate high points, install air release valves [**as specified in Section 400578.11 - Air Release Valves for Water Service,**] [**as indicated on Drawings,**] [**and**] as directed by [**Director’s Representative**] <**\_\_\_\_\_\_\_\_**>.

Bearing:

Maintain bearing along entire length of pipe.

[**Excavate bell holes to permit proper joint installation.**]

Do not lay pipe in wet or frozen trench.

Prevent foreign material from entering pipe during placement.

Close pipe openings with watertight plugs during Work stoppages.

Install access fittings to permit disinfection of water system performed under Section [**330110.58 - Disinfection of Water Utility Piping Systems**] <**\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_**>.

Cover:

Establish elevations of buried piping with not less than <**\_\_\_\_\_\_\_\_**> feet of cover.

Measure depth of cover from final surface grade to top of pipe barrel.

Pipe Markers: As specified in Section 330597 - Identification and Signage for Utilities.

* + - * 1. Tapping Sleeves and Valves: As indicated on [**Shop**] Drawings and according to manufacturer instructions.
				2. Thrust Restraints: As specified in Section 330509.33 - Thrust Restraint for Utility Piping.
				3. Service Connections: As specified in Section 331417 - Site Water Service Utility Laterals.
				4. Backfilling:

Backfill around sides and to top of pipe with cover fill in minimum lifts of [**6**] <**\_\_\_\_\_\_\_\_**> inches, tamp in place, and compact to [**95**] <**\_\_\_\_\_\_\_\_**> percent of maximum density.

[**Place and compact material immediately adjacent to pipes to avoid damage to pipe and prevent pipe misalignment.**]

Maintain optimum moisture content of bedding material to attain required compaction density.

* + - * 1. Disinfection of Potable-Water Piping Systems: As specified in Section 330110.58 - Disinfection of Water Utility Piping Systems.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Installation Standards: Install Work according to <**\_\_\_\_\_\_\_\_**> standards.
			1. TOLERANCES
				1. Install pipe to indicated elevation within tolerance of [**5/8**] <**\_\_\_\_\_\_\_\_**> inch
			2. FIELD QUALITY CONTROL
				1. Piping System Pressure Testing: As indicated on pipe schedule.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Piping System Pressure Testing:

Test Pressure: Not less than 200 psig or 50 psi in excess of maximum static pressure, whichever is greater.

Conduct hydrostatic test for minimum [**two**] <**\_\_\_\_\_\_\_\_**> hours.

Slowly fill section to be tested with water; expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.

Observe joints, fittings, and valves under test; remove and renew cracked pipes, joints, fittings, and valves showing visible leakage; retest.

Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate. Maintain pressure within plus or minus 5 psi of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.

Compute maximum allowable leakage using following formula:

L = SD x sqrt(P)/C.

L = testing allowance, gph

S = length of pipe tested, feet

D = nominal diameter of pipe, inches

P = average test pressure during hydrostatic test, psig

C = 148,000

If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

Leakage:

If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.

Correct visible leaks regardless of quantity of leakage.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

In following Paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform pressure test on piping according to <**\_\_\_\_\_\_\_\_**> standards.

Select test standards referenced in following Paragraph appropriate for fill materials and Project requirements. Consult geotechnical report. In following Paragraph, AASHTO T 180 is similar to ASTM D1557.

* + - * 1. Compaction Testing for Bedding: Comply with [**ASTM D1557**] [**ASTM D698**] [**AASHTO T 180**] [**ASTM D6938**].
				2. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
				3. Frequency of Compaction Tests: <**\_\_\_\_\_\_\_\_**>.

END OF SECTION 400539.13