SECTION 333123 - SANITARY SEWERAGE FORCE MAIN PIPING

This Section specifies pipe materials and accessories normally used with municipal sanitary sewerage force mains.

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

Force mains.

* + - * 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 033000 - Cast-in-Place Concrete: Concrete material requirements.

Section 310001 – Earthwork Materials: Soil backfill from above pipe to finish grade.

Section 310000 – Earthwork: Excavation, backfill, and compaction.

Section 330505.31 - Hydrostatic Testing: Pressure testing of completed force mains.

Section 330509.33 - Thrust Restraint for Utility Piping: Thrust restraints as required by this Section.

Section 330561 - Concrete Manholes: Connection to sanitary sewerage system.

Section 330573 - Polyethylene Manholes: Connection to sanitary sewerage system.

Section 330576 - Fiberglass Manholes: Connection to sanitary sewerage system.

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

* + - 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. Consider including publication dates for referenced standards in this Section to ensure the correct standard is used for LEED compliance.

* + - * 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 C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.

AWWA C110 - Ductile-Iron and Gray-Iron Fittings.

AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.

AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In., for Water Transmission and Distribution.

* + - * 1. ASTM International:

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 D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

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

* + - 1. COORDINATION
				1. Coordinate Work of this Section with connection to existing [**municipal sewer utility service**] <**\_\_\_\_\_\_\_\_**>.
			2. PREINSTALLATION MEETINGS
				1. Convene minimum [**one week**] [**<\_\_\_\_\_\_\_\_> weeks**] prior to commencing Work of this Section.
			3. 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 indicating pipe material used, pipe accessories, valves [**, restrained joint details and materials**] [**, and**] <**\_\_\_\_\_\_\_\_**>.
				5. Shop Drawings:

Indicate piping piece numbers and locations.

Indicate restrained joint locations.

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

Include separate paragraphs for additional certifications.

Include following paragraph when Contractor is responsible for designing products or assemblies. List affected products when Section specifies more than one product.

* + - * 1. Delegated Design Submittals: Shop Drawings with design calculations and assumptions for restrained joints, including establishing lengths of restrained joint piping required. Shop Drawings shall be signed and sealed by a professional engineer licensed in the State of New York.
				2. Manufacturer Instructions: Submit special procedures required to install specified products.
				3. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
				4. Qualifications Statement:

Coordinate following subparagraph with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer, installer, and licensed professional.

Remove paragraph if not LEED project.

* + - 1. SUSTAINABLE DESIGN SUBMITTALS
				1. Section 018113 - LEED Documentation Requirements: Requirements for sustainable design submittals.
				2. 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.

Salvaged, refurbished, and reused products.

Products with recycled material content.

Regional products.

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

* + - 1. CLOSEOUT SUBMITTALS
				1. Section 017716 - Contract Closeout: Requirements for submittals.
				2. Project Record Documents: Record [**invert**] [**centerline**] elevations and actual locations of pipe runs and connections.
				3. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
			2. QUALITY ASSURANCE

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 minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
				2. Installer: Company specializing in performing Work of this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
				3. Licensed Professional: [**Professional Engineer**] <**\_\_\_\_\_\_\_\_**> experienced in design of specified Work and licensed [**in the State of New York**].
			1. DELIVERY, STORAGE, AND HANDLING
				1. Section 016500 - Materials and Equipment: Requirements for transporting, handling, storing, and protecting products.
				2. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
				3. Storage:

Store materials according to manufacturer instructions.

Do not place materials on private property without written permission of property Director’s Representative.

Do not stack pipe higher than recommended by pipe manufacturer.

* + - * 1. Protection:

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

Store gaskets for mechanical and push-on joints in cool and dry location, out of direct sunlight, and not in contact with petroleum products.

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. FORCE MAIN
				1. Ductile-Iron Pipe:

Comply with AWWA C151.

Standard cement-mortar lining, according to AWWA C104, and outside coating.

Pressure Classes:

Sizes 3 to 12 Inches: 350 psig.

Sizes 14 to 20 Inches: [**250**] [**300**] [**350**] psig.

Size 24 Inches: [**200**] [**250**] [**300**] [**350**] psig.

Sizes 30 to 48 Inches: [**150**] [**200**] [**250**] [**300**] [**350**] psig.

* + - * 1. Ductile-Iron Fittings:

Comply with AWWA C110.

Pressure Rating: [**150**] [**250**] [**350**] psig.

Cement mortar lined, according to AWWA C104, and outside coated.

* + - * 1. Joints:

Comply with AWWA C111.

Type: [**Mechanical**] [**or**] [**push on**].

* + - * 1. Rubber Gaskets, Lubricants, Glands, Bolts, and Nuts: Comply with AWWA C111.
			1. PVC PIPE
				1. PVC Pressure Sewer Pipe and Fittings, 12-Inch Nominal Size and Smaller:

Comply with ASTM D2241.

[**PVC 1120 (12454)**] [**or**] [**PVC 1220 (12454)**] [**or**] [**PVC 2120 (14333)**].

SDR: <**\_\_\_\_\_\_\_\_**>.

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

* + - * 1. PVC Pressure Sewer Pipe and Fittings, 12-Inch Nominal Size and Smaller:

Comply with ASTM D1785.

Schedule 40.

Fittings: Comply with ASTM D2466.

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

* + - * 1. PVC Pressure Sewer Pipe and Fittings, 12-Inch Nominal Size and Smaller:

Comply with ASTM D1785.

Schedule 80.

Fittings: Comply with ASTM D2467.

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

* + - * 1. PVC Pressure Sewer Pipe and Fittings, 12-Inch Nominal Size and Smaller:

Comply with AWWA C900.

Class 235.

Joints: Internally restrained.

Remove paragraph if not LEED project.

* + - 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. Section 018113 - LEED Documentation Requirements: Requirements for sustainable design compliance.
				2. 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 based on Project conditions. If more than one type is required, edit following paragraph.

* + - * 1. Bedding and Cover:

Bedding: As specified in Section [**310001 – Earthwork Materials**] <**\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_**>.

Soil Backfill from above Pipe to Finish Grade: As specified in Section [**310001 – Earthwork Materials**] <**\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_**>.

Subsoil: No rocks more than 6 inches in diameter, frozen earth, or foreign matter.

* + - 1. MIXES
				1. Concrete: As specified in Section 033000 - Cast-in-Place Concrete.
			2. ACCESSORIES
				1. Pipe Markers: As specified in Section 330597 - Identification and Signage for Utilities.
1. EXECUTION
	* + 1. EXAMINATION
				1. Verify that [**trench cut**] [**excavation base**] is ready to receive Work.
				2. Verify that excavations, dimensions, and elevations are as indicated on [**Drawings**] [**Shop Drawings**].
			2. PREPARATION

Type of correcting materials (fine aggregate, coarse aggregate, or lean concrete) depends on type of subsoil, percolation characteristics, and compaction requirements at Site.

* + - * 1. Correct over-excavation with [**fine aggregate**] [**coarse aggregate**] [**lean concrete**].
				2. Remove large stones or other hard matter capable of damaging pipe or of impeding consistent backfilling or compaction.
			1. INSTALLATION
				1. Bedding:

Excavate pipe trench as specified in Section [**310000 - Earthwork**] <**\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_**>.

Place bedding material at trench bottom.

Level materials in continuous layers not exceeding [**6**] [**8**] <**\_\_\_\_\_\_\_\_**> inches in depth.

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

* + - * 1. Piping:

Refer to geotechnical report for subsoil capability to support piping, and for compaction of fill requirements. Coordinate referenced standards and manufacturer instructions to avoid conflicting statements.

Install pipe, fittings, and accessories as indicated on [**Drawings**] [**Shop Drawings**].

Verify that sewer system is indicated on Drawings or will be included on Shop Drawings. Drawing details should describe location of aggregate types in relation to pipe and pipe bedding, dimensions of cut trench width, and details of connections to other Work.

Route piping in straight line.

Install bedding at sides and over top of pipe to minimum compacted thickness of [**12**] <**\_\_\_\_\_\_\_\_**> inches.

Following subparagraph makes direct reference to Section 310000 for backfilling and compaction. Edit subparagraph to include specific requirements if criteria in Section 310000 are inappropriate.

Backfilling and Compacting:

As specified in Section [**310000 - Earthwork**] <**\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_**>.

Do not displace or damage pipe while compacting.

Connect to [**municipal sewer system**] <**\_\_\_\_\_\_\_\_**>.

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

* + - * 1. Thrust Restraints:

Provide pressure pipeline with restrained joints or concrete thrust blocking at pumps, bends, tees, and changes in direction.

As specified in Section 330509.33 - Thrust Restraint for Utility Piping.

* + - * 1. Cradles and Encasements: Provide concrete cradles and encasements for pipelines [**where indicated on Drawings**] [**where indicated on Shop Drawings**] [**and**] as specified in Section 033000 - Cast-in-Place Concrete.
			1. FIELD QUALITY CONTROL
				1. Inspections: Request inspection by [**Director’s Representative**] <**\_\_\_\_\_\_\_\_**> prior to [**and immediately after**] placing bedding.
				2. Pressure Testing: As specified in Section 330505.31 - Hydrostatic Testing.

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

* + - * 1. Pressure Testing:

Pressure:

Not less than <**\_\_\_\_\_\_\_\_**> psig or <**\_\_\_\_\_\_\_\_**> psi in excess of maximum static pressure, whichever is greater.

Maintain pressure within plus or minus 5 psi of test pressure.

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

Time: As indicated on [**Drawings**] [**piping schedule**].

Initial Procedure:

Install corporation cocks at high points.

Slowly fill section to be tested with water, expelling air from piping at high points from air vents and by opening corporation cocks.

Close air vents and corporation cocks after air is expelled.

Raise pressure to specified test pressure.

Testing:

Observe joints, fittings, and valves under test.

Remove and replace cracked pipes, joints, fittings, and valves showing visible leakage.

Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.

Coordinate repairs with the Director’s Representative.

Leakage:

Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.

Maximum Allowable Leakage:

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.

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.

Coordinate repairs with the Director’s Representative.

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

* + - * 1. Compaction Testing:

Comply with Section 310000 - Earthwork.

Testing Frequency: <**\_\_\_\_\_\_\_\_**>.

* + - 1. PROTECTION
				1. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 333123