

GP 03-02-01	Sewer Systems	May 2004
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Sewer Systems

GP 03-02-01

Scope

[I] This Global Practice (GP) covers the design and installation of industrial, chemical, storm water and sanitary sewer wastewater collection systems. It does not cover the design and installation of above ground or pumped systems, or waste treatment facilities or structures.

[I] An asterisk (*) indicates that additional information from the Owner's Engineer is required or approval by the Owner's Engineer is required.

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1. Required References

[I] This Section lists Practices and Standards that are referenced and assumed to be a part of this document. Unless otherwise specified herein, use the latest edition as applicable.

1.1. Global Practices–ExxonMobil Engineering Practices

GP 04-03-01	Plant Buildings for Operation and Storage
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1.2. ASTM–American Society for Testing and Materials

ASTM A 48/A 48M	Standard Specification for Gray Iron Castings
ASTM A 53/A 53M	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 74	Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A 746	Standard Specification for Ductile Iron Gravity Sewer Pipe
ASTM C 12	Standard Practice for Installing Vitrified Clay Pipe Lines
ASTM C 14	Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C 32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C 76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C 139	Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM C 279	Standard Specification for Chemical-Resistant Masonry Units
ASTM C 361	Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
ASTM C 425	Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings
ASTM C 443	Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C 466	Standard Specification for Chemically Setting Silicate and Silica Chemical-Resistant Mortars
ASTM C 478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 700	Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated



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ASTM C 1433	Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
ASTM D 471	Standard Test Method for Rubber Property - Effect of Liquids
ASTM D 1869	Standard Specification for Rubber Rings for Asbestos-Cement Pipe
ASTM D 2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2665	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3035	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D 3262	Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe
ASTM D 3753	Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells
ASTM D 3754	Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe
ASTM D 3839	Standard Practice for Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM D 3840	Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications
ASTM F 477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 679	Standard Specification for Poly(Vinyl Chloride)(PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F 714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F 789	Standard Specification for Type PS-46 and Type PS-115 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings
ASTM F 894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F 949	Standard Specification for Poly(Vinyl Chloride)(PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F 1336	Standard Specification for Poly(Vinyl Chloride)(PVC) Gasketed Sewer Fittings

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1.3. AWWA–American Water Works Association

AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in. (76 mm Through 1219 mm), for Water
AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C203	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied

[I] Local codes and standards may be substituted for the ones referenced herein provided the following provisions are met:

- 1) The resultant design meets the safety and serviceability criteria attained through this Practice.
- 2) Substitution is accepted by the authorities where the facility is to be located and by the Owner's Engineer.

[I] Sewer systems shall be designed to meet local codes and regulations.

[I] Air emissions from the sewer wastewater system shall be controlled as required by industrial hygiene and local environmental requirements.

2. Definitions

Term	[I] Description
Catch Basins	Used to collect surface drainage and process wastes in individual drainage areas and to trap sediment at the point nearest the source.
Chemical Sewers	Collect acid, caustic or other chemical wastes which require neutralization or treatment prior to discharge to industrial sewers.
Combined Sewer Systems	Those systems which combine two or more types of system (service) prior to any treatment. The most common type of combined system is an Industrial and Storm Water Sewer System. Combined systems shall meet the most stringent requirements of all the individual sewer systems included in the combined system.
Deferred Runoff	The controlled release of rainwater which has been held or impounded during the rainfall in a designated area such as a tank dike enclosure.
Drains	Small sewer inlets/connections (such as an open end pipe or fitting) discharging through a sealed connection to the sewer system from discrete sources, such as pump bases, equipment drips, low points of floors, etc., but not from outside surface drainage.



Term	[I] Description
Hydraulic Seals	Used to prevent vapor emission out of inlets, and to isolate the various parts of a sewer system, preventing vapor travel and spread of fire or explosion. Such seals shall be a minimum 6 in. (150 mm), unless otherwise specified.
Industrial or Oily Water Sewers	Collect process wastewater, and hydrocarbon/oil contaminated wastewater including rainwater or firewater runoff from areas normally subject to hydrocarbon/oil contamination and condensate/blowdown with hydrocarbon/oil or chemical contaminants.
Integrated Plant	A group of two or more individual process units located within a common process block and designed to be interdependent in operation (heat exchanger integration, lack of intermediate tankage, etc.).
Laterals	Sewer lines collecting the effluent from two or more sublaterals discharging to manholes on mains.
Mains	Sewer lines connecting manhole to manhole carrying combined effluent from laterals or sublaterals.
Manholes	Used in sewers as junction points and sediment traps, and to provide access for maintenance and inspection
Open Channel Floor or Pavement Drains	Continuous troughs or trenches collecting surface drainage discharging to the sewer system.
Sanitary Sewers	Collect waste from the toilet facilities, lavatories, showers, and floor drains in rest, wash, and locker rooms.
Storm Water or Clean Water Sewers	Collect rain water runoff, firewater and condensate/blowdown that are not normally subject to hydrocarbon/oil, or toxic chemical contamination.
Sublaterals	Sewer branches collecting effluent from individual inlets such as drains and catch basins.
Toe Walls	Raised curbs which control spillage and drainage of storm, process, and firewater.
Vents	Pipes open to the atmosphere to prevent blowing of seals by pressure buildup.

3. Materials

- 1) [R] Sewer piping material selection shall be based upon the design structural loading conditions and shall comply with the applicable ASTM standards and limitations listed in Table 1.

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Table 1: Sewer Pipe Material Requirements

Pipe Material	ASTM Standard	Limitations
Cast-Iron Soil Pipe (CISP)	ASTM A 74	CISP shall be extra-heavy.
Ductile Iron	ASTM A 746 AWWA C151/A21.51	Can be used for any service where chemically resistant to waste. Fittings shall be according to AWWA C110/A21.10.
Reinforced Concrete Pipe or Culvert	ASTM C 14 ASTM C 76 ASTM C 361 ASTM C 1433	Can be used for any service where chemically resistant to waste. Internally coat with coal tar-polyamide epoxy for waste containing sulfur compounds, or anaerobic conditions favorable to hydrogen sulfide generation.
Carbon Steel	ASTM A 53/A 53M	Black steel, flanged pipe shall be internally lined according to AWWA C203, and can be used for any service where lining is chemically resistant to waste. Welded pipe is not suitable where internal coating can not be applied to joints after welding. Externally coat and wrap all CS pipe according to AWWA C203 as follows: Single-Coat, Single-Wrap; or Double-Coat, Double-Wrap system
"Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin)	ASTM D 3262 ASTM D 3754	Resins, and coatings if applicable, shall be selected to be resistant to all wastewater chemical constituents and environmental (temperature, etc.) conditions anticipated. Installation shall be according to ASTM D 3839.
Polyethylene (PE) (HDPE)	ASTM D 3035 ASTM F 714 ASTM F 894	Can be used for any service where chemically resistant to waste, and operating temperatures do not exceed material limits. Installation shall be according to ASTM D 2321.
Poly Vinyl Chloride (PVC)	ASTM D 2241 ASTM D 2665 ASTM D 3034 ASTM F 679 ASTM F 789 ASTM F 949	Can be used for any service where chemically resistant to waste, and operating temperatures do not exceed material limits. Gasketed fittings shall be according to ASTM F 1336. Installation shall be according to ASTM D 2321.
Vitrified Clay	ASTM C 700	Only for use in non-impact and no direct contact load situations.

