SECTION 221300 - FACILITY SANITARY SEWERAGE

This Section includes pipe materials, fittings, equipment and pumps normally encountered in sanitary piping systems consisting of soil, waste, and vent.

Coordinate location of piping, valves, and hangers and supports with other sections in this Division. When Section 220529, Section 220503, and Section 220523 are used consider deleting duplicate requirements and referencing appropriate sections.

This Section includes performance, proprietary, and descriptive specifications. Edit to avoid conflicting requirements.

This Section may include term "Architect/Engineer." "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See Drawing Coordination Checklist and Evaluations for information needed to coordinate this Specification Section with Drawings.

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

Sanitary sewer piping buried beyond 5 feet of building.

Sanitary sewer piping buried within 5 feet of building.

Sanitary sewer piping above grade.

Chemical resistant sewer piping.

Unions and flanges.

Valves.

Pipe hangers and supports.

Floor drains.

Floor sinks.

Planter drains.

Cleanouts.

Backwater valves.

Sumps.

Interceptors.

Manholes.

Sewage ejectors.

Bedding and cover materials.

* + - * 1. Related Sections:

Section 033000 - Cast-In-Place Concrete: Execution requirements for placement of concrete specified by this section.

Use the following reference when firestopping is specified in another Division.

Section 078413 – Penetration Firestopping: Product requirements for firestopping for placement by this section.

Section 083113 - Access Doors and Frames: Product requirements for access doors for placement by this section.

Section 099114 and/or 099600 - Painting and Coating: Product and execution requirements for painting specified by this section.

Use the following when pipe materials are specified in one location in this Division.

Section 220513 - Common Motor Requirements for Plumbing Equipment: Product requirements for motors for placement by this section.

Section 220516 - Expansion Fittings and Loops for Plumbing Piping: Execution requirements for pipe expansion devices for placement by this section.

Use the following when valves are specified in one location in this Division.

Section 220523 - General-Duty Valves for Plumbing Piping: Product requirements for valves for placement by this section.

Retain choice in the following paragraph when firestopping is specified in this Division.

Section 220529 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports [**and firestopping**] for placement by this section.

Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product requirements for vibration isolators for placement by this section.

Section 220553 - Identification for Plumbing Piping and Equipment: Product requirements for pipe identification for placement by this section.

Section 220700 - Plumbing Insulation: Product and execution requirements for pipe insulation.

* + - 1. REFERENCES

List reference standards included within text of this section. Edit the following for Project conditions.

* + - * 1. American Society of Mechanical Engineers:

ASME A112.14.1 - Backwater Valves.

ASME A112.14.3 - Grease Interceptors.

ASME A112.14.4 - Grease Removal Devices.

ASME A112.21.1 - Floor Drains.

ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

ASME B16.3 - Malleable Iron Threaded Fittings.

ASME B16.4 - Gray Iron Threaded Fittings.

ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).

ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

ASME B31.9 - Building Services Piping.

* + - * 1. ASTM International:

ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.

ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.

ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

ASTM A536 - Standard Specification for Ductile Iron Castings.

ASTM B32 - Standard Specification for Solder Metal.

ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.

ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.

ASTM B75 - Standard Specification for Seamless Copper Tube.

ASTM B88 - Standard Specification for Seamless Copper Water Tube.

ASTM B251 - Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.

ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes.

ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).

ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.

ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.

ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

ASTM C1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.

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

ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

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 D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

ASTM D2996 - Standard Specification for Filament-Wound Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.

ASTM D2997 - Standard Specification for Centrifugally Cast Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

ASTM D3262 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.

ASTM D3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe.

ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe.

ASTM D3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications.

ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core.

ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

* + - * 1. Cast Iron Soil Pipe Institute:

CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

* + - * 1. Manufacturers Standardization Society of the Valve and Fittings Industry:

MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

MSS SP 70 - Cast Iron Gate Valves, Flanged and Threaded Ends.

MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.

MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.

MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

* + - * 1. Plumbing and Drainage Institute:

PDI G101 - Standard - Testing and Rating Procedure for Grease Interceptors.

* + - 1. 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. Section 013300 - Submittal Procedures: Submittal procedures.
				5. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes for sewage-ejectors, and manholes.
				6. Product Data:

Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.

Valves: Submit manufacturers catalog information with valve data and ratings for each service.

Hangers and Supports: Submit manufacturers catalog information including load capacity.

Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.

Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

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

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel 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 products meet or exceed specified requirements.
			1. CLOSEOUT SUBMITTALS
				1. Project Record Documents: Record actual locations of equipment and clean-outs.
				2. Operation and Maintenance Data: Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.
			2. QUALITY ASSURANCE
				1. Perform Work in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

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

* + - * 1. Maintain one copy of each document on site.
			1. QUALIFICATIONS
				1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [**documented**] experience [**, and with sewage ejector service facilities within [100] <\_\_\_\_\_\_\_\_> miles of Project**].
				2. Installer: Company specializing in performing Work of this section with minimum three years [**documented**] experience [**approved by manufacturer**].
			2. PRE-INSTALLATION MEETINGS
				1. Section 013000 - Administrative Requirements: Pre-installation meeting.
				2. Convene minimum [**one**] <**\_\_\_\_\_\_\_\_**> week prior to commencing work of this section.
			3. DELIVERY, STORAGE, AND HANDLING
				1. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.
			4. ENVIRONMENTAL REQUIREMENTS
				1. Do not install underground piping when bedding is wet or frozen.
			5. FIELD MEASUREMENTS
				1. Verify field measurements prior to fabrication.
			6. WARRANTY

This article extends warranty period beyond one year. Extended warranties increase construction costs and Owner enforcement responsibilities. Specify warranties with caution.

* + - * 1. Furnish [**five**] <**\_\_\_\_\_\_\_\_**> year manufacturer warranty for [**sewage ejectors**] <**\_\_\_\_\_\_\_\_**>.
			1. EXTRA MATERIALS
				1. Furnish [**two**] <**\_\_\_\_\_\_\_\_**> sets of [**pump seals**] <**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**>.
1. PRODUCTS
	* + 1. SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

This article contains piping that may be specified in site utility sections. Coordinate with site utility sections to avoid duplication.

Cast or ductile iron pipe is normally used for durability, longevity, resistance to corrosion, acids, gases, and resistance to induced subsoil loads; is available in 5 and 10 foot lengths and diameters ranging from 2 to 15 inches. Pipe ends are usually bell and spigot but can be specified with plain end for mechanical clamp and gasket joint.

* + - * 1. Cast Iron Soil Pipe: ASTM A74 (Standard Specification for Cast Iron Soil Pipe and Fittings), [**extra heavy**] [**service**] weight, [**bell and spigot**] [**plain**] ends.

Fittings: Cast iron, ASTM A74 (Standard Specification for Cast Iron Soil Pipe and Fittings).

Joints: ASTM C564 (Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings), rubber gasket joint devices.

Pressure classes define pipe wall thickness depending on pipe size. Available pressure classes include 150, 200, 250, 300, and 350. Insert pressure class required for project conditions. Smaller pipe sizes are not available in lesser pressure classes.

* + - * 1. Ductile Iron Pipe: AWWA C150 or AWWA C151, [**<\_\_\_\_\_\_\_\_> minimum pressure class,**] [**50**] [**52**] [**54**] [**minimum special class**], [**bell and spigot**] [**plain**] ends.

Fittings: AWWA C110, [**ductile**] [**gray**] iron, standard thickness.

Joints: AWWA C111, rubber gasket joint devices.

Concrete pipe, un-reinforced, is normally used in non-pressure applications and where subsoil backfill will not induce loads causing pipe fracture. Sizes range from 4 to 36 inches. Class 1, 2, and 3 designations refer to pipe strength. Absorption of moisture may be a concern in using this pipe material.

* + - * 1. Concrete Pipe: [**ASTM C14**], Class [**1**] [**2**] [**3**]; un-reinforced, [**bell and spigot**] [**plain**] <**\_\_\_\_\_\_\_\_**> ends.

Fittings: Concrete pipe, [**ASTM C14**]

Joints: [**ASTM C443**], rubber compression gasket.

Reinforced concrete pipe is normally used for larger diameter applications, for low pressure applications, or where subsoil pressure requires greater pipe strength than un-reinforced concrete type. Sizes range from 12 to 108 inches depending on Class and Wall type. Absorption of moisture may be a concern in using this pipe material.

* + - * 1. Reinforced Concrete Pipe: [**ASTM C76**], Class [**I**] [**II**] [**III**] [**IV**] [**V**] with Wall Type [**A**] [**B**] [**C**]; [**mesh**] [**bar**] reinforcement, [**bell and spigot**] <**\_\_\_\_\_\_\_\_**> ends.

Fittings: Reinforced concrete.

Joints: [**ASTM C443**], rubber compression gasket.

Plastic pipe is normally used for acidic or corrosive waste sewer systems, ease of jointing, reasonably flexible in moving subsoils, and is relatively impervious to moisture infiltration or exfiltration. ABS pipe is described in ASTM D2751. PVC pipe is covered in ASTM D2729, and ASTM D3034; each offering various qualities and characteristics.

* + - * 1. ABS Pipe: ASTM D2751, SDR [**23.5**] [**35**] [**42**], Acrylonitrile-Butadiene-Styrene (ABS) material, bell and spigot style solvent sealed ends.

Fittings: ABS, ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings).

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. ABS Pipe: ASTM F628 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core), Acrylonitrile-Butadiene-Styrene (ABS) material.

Fittings: ABS.

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. ABS Pipe: ASTM D2661 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings), Acrylonitrile-Butadiene-Styrene (ABS) material.

Fittings: ABS, ASTM D2661 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings).

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. PVC Pipe: ASTM D2729 (Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings), polyvinyl chloride (PVC) material, bell and spigot solvent sealed ends.

Fittings: PVC, ASTM D2729 (Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings).

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) solvent cement.

Use the following plastic pipe, up to 12 inches diameter.

* + - * 1. PVC Pipe: ASTM D1785 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120), Schedule [**40**] [**80**] [**120**], polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.

Fittings: [**ASTM D2466, Schedule 40, PVC**] [**ASTM D2467, Schedule 80, PVC**] [**ASTM D2464 PVC, threaded**].

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) Solvent cement.

* + - * 1. PVC Pipe: ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings) or ASTM D3034 (Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings) SDR 26, polyvinyl chloride (PVC) material.

Fittings: PVC, ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings) or ASTM D3034 (Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings).

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) solvent cement.

Copper tubing Type designations apply only to tubing furnished under ASTM B88. Types indicate wall thickness. Type K has greatest wall thickness; Type M the least wall thickness.

* + - * 1. Copper Tube: [**ASTM B75**] [**ASTM B88**] [**ASTM B251**] Type [**K**] [**L**] annealed.

Fittings: ASME B16.23 (Cast Copper Alloy Solder Joint Drainage Fittings (DWV)), cast bronze, or ASME B16.29 (Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV), wrought copper.

ASTM B32 permits up to 0.1 percent lead content in solders not classified as containing lead.

Joints: ASTM B32 (Standard Specification for Solder Metal), Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, [**lead free**] solder.

* + - 1. SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

Cast or ductile iron pipe is normally used for durability, longevity, resistance to corrosion, acids, gases, and resistance to induced subsoil loads; is available in 5 and 10 foot lengths and diameters ranging from 2 to 15 inches. Pipe ends are usually bell and spigot but can be specified with plain end for mechanical clamp and gasket joint.

* + - * 1. Cast Iron Soil Pipe: ASTM A74 (Standard Specification for Cast Iron Soil Pipe and Fittings), [**extra heavy**] [**service**] weight, [**bell and spigot**] [**plain**] ends.

Fittings: Cast iron, ASTM A74 (Standard Specification for Cast Iron Soil Pipe and Fittings).

Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 (Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings) neoprene gaskets or lead and oakum.

* + - * 1. Cast Iron Pipe: CISPI 301 (Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications), hub-less.

Fittings: Cast iron, CISPI 301 (Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications).

Joints: CISPI 310 (Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications), neoprene gasket and stainless steel clamp and shield assemblies.

Pressure classes define pipe wall thickness depending on pipe size. Available pressure classes include 150, 200, 250, 300, and 350. Insert pressure class required for project conditions. Smaller pipe sizes are not available in lesser pressure classes.

* + - * 1. Ductile Iron Pipe: AWWA C150 or AWWA C151, [**<\_\_\_\_\_\_\_\_> minimum pressure class,**] [**50**] [**52**] [**54**] [**minimum special class**], [**bell and spigot**] [**plain**] ends.

Fittings: AWWA C110, [**ductile**] [**gray**] iron, standard thickness.

Joints: AWWA C111, rubber gasket joint devices.

Concrete pipe, un-reinforced, is normally used in non-pressure applications and where subsoil backfill will not induce loads causing pipe fracture. Sizes range from 4 to 36 inches. Class 1, 2, and 3 designations refer to pipe strength. Absorption of moisture may be a concern in using this pipe material.

* + - * 1. Concrete Pipe: ASTM C14 (Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe), Class [**1**] [**2**] [**3**]; un-reinforced, [**bell and spigot**] [**plain**] <**\_\_\_\_\_\_\_\_**> ends.

Fittings: Concrete pipe, ASTM C14 (Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe).

Joints: ASTM C443 (Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets), rubber compression gasket.

Reinforced concrete pipe is normally used for larger diameter applications, for low pressure applications, or where subsoil pressure requires greater pipe strength than un-reinforced concrete type. Sizes range from 12 to 108 inches depending on Class and Wall type. Absorption of moisture may be a concern in using this pipe material.

* + - * 1. Reinforced Concrete Pipe: ASTM C76 (Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe), Class [**I**] [**II**] [**III**] [**IV**] [**V**] with Wall Type [**A**] [**B**] [**C**]; [**mesh**] [**bar**] reinforcement, [**bell and spigot**] <**\_\_\_\_\_\_\_\_**> ends.

Fittings: Reinforced concrete.

Joints: ASTM C443 (Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets), rubber compression gasket.

Plastic pipe is normally used for acidic or corrosive waste sewer systems, ease of jointing, reasonably flexible in moving subsoils, and is relatively impervious to moisture infiltration or exfiltration. ABS pipe is described in ASTM D2751. PVC pipe is covered in ASTM D2729, and ASTM D3034; each offering various qualities and characteristics.

* + - * 1. ABS Pipe: ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings), SDR [**23.5**] [**35**] [**42**], Acrylonitrile-Butadiene-Styrene (ABS) material, bell, and spigot style solvent sealed ends.

Fittings: ABS, ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings).

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. ABS Pipe: ASTM F628 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core), Acrylonitrile-Butadiene-Styrene (ABS) material.

Fittings: ABS.

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. ABS Pipe: ASTM D2661 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings), Acrylonitrile-Butadiene-Styrene (ABS) material.

Fittings: ABS, ASTM D2661 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings).

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. PVC Pipe: ASTM D2729 (Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings), polyvinyl chloride (PVC) material, bell and spigot solvent sealed ends.

Fittings: PVC, ASTM D2729 (Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings).

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) solvent cement.

Use the following plastic pipe, up to 12 inches diameter.

* + - * 1. PVC Pipe: ASTM D1785 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120), Schedule [**40**] [**80**] [**120**], polyvinyl chloride (PVC) material, bell and spigot style solvent sealed joint ends.

Fittings: [**ASTM D2466, Schedule 40, PVC**] [**ASTM D2467, Schedule 80, PVC**] [**ASTM D2464 PVC, threaded**].

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) Solvent cement.

Copper tubing Type designations apply only to tubing furnished under ASTM B88. Types indicate wall thickness. Type K has greatest wall thickness; Type M the least wall thickness.

* + - * 1. Copper Tube: [**ASTM B306, DWV**] [**ASTM B75**] [**ASTM B88**] [**ASTM B251**] Type [**K**] [**L**] [**M**].

Fittings: ASME B16.23 (Cast Copper Alloy Solder Joint Drainage Fittings (DWV)), cast bronze, or ASME B16.29 (Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV) wrought copper.

ASTM B32 permits up to 0.1 percent lead content in solders not classified as containing lead.

Joints: ASTM B32 (Standard Specification for Solder Metal), Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, [**lead free**] solder

* + - * 1. PVC Pipe: ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings) or ASTM D3034 (Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings) SDR 26, polyvinyl chloride (PVC) material.

Fittings: PVC, ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings) or ASTM D3034 (Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings).

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) solvent cement.

* + - * 1. Fiberglass Pipe: ASTM D3262 (Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe), glass fiber reinforced thermosetting resin material.

Fittings: ASTM D3840 (Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications).

Joints: Epoxy.

* + - * 1. Fiberglass Pipe: ASTM D3754 (Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe), ASTM D3517 (Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe), ASTM D2996 (Standard Specification for Filament-Wound Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe) and ASTM D2997 (Standard Specification for Centrifugally Cast Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe), glass fiber reinforced thermosetting resin material.

Fittings: Custom laminated fiberglass.

Joints: Epoxy.

* + - 1. SANITARY SEWER PIPING, ABOVE GRADE
				1. Cast Iron Pipe: ASTM A74 (Standard Specification for Cast Iron Soil Pipe and Fittings), service weight.

Fittings: Cast iron, ASTM A74 (Standard Specification for Cast Iron Soil Pipe and Fittings).

Joints: ASTM C564 (Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings), rubber gasket joint devices or lead and oakum.

* + - * 1. Cast Iron Pipe: CISPI 301 (Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications), hub-less, service weight.

Fittings: Cast iron, CISPI 301 (Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications).

Joints: CISPI 310 (Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications), neoprene gaskets and stainless steel clamp-and-shield assemblies.

Copper tubing Type designations apply only to tubing furnished under ASTM B88. Types indicate wall thickness. Type K has greatest wall thickness; Type M the least wall thickness.

* + - * 1. Copper Tube: [**ASTM B306, DWV**] [**ASTM B75**] [**ASTM B88**] [**ASTM B251**] Type [**K**] [**L**] [**M**].

Fittings: ASME B16.23 (Cast Copper Alloy Solder Joint Drainage Fittings (DWV)), cast bronze, or ASME B16.29 (Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV), wrought copper.

ASTM B32 permits up to 0.1 percent lead content in solders not classified as containing lead.

Joints: ASTM B32 (Standard Specification for Solder Metal), Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, [**lead free**] solder

* + - * 1. Copper Pipe: [**ASTM B42,**] [**Temper O61 annealed**] [**Temper H80 hard drawn**] [**ASTM B302**].

Fittings: ASME B16.23 (Cast Copper Alloy Solder Joint Drainage Fittings (DWV)), cast bronze, or ASME B16.29 (Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV) wrought copper.

Joints: ASTM B32 (Standard Specification for Solder Metal), Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, [**lead free**] solder.

* + - * 1. Aluminum DWV Pipe: CAN 3-B281.

Fittings: Cast iron, ASTM A74 (Standard Specification for Cast Iron Soil Pipe and Fittings).

Joints: [**ASTM C564**] [**CISPI 310**], thermoplastic rubber coupling and stainless steel clamps.

* + - * 1. Brass Pipe: ASTM B43 (Standard Specification for Seamless Red Brass Pipe, Standard Sizes), chrome plated.

Fittings: ASME B16.23 (Cast Copper Alloy Solder Joint Drainage Fittings (DWV)), cast bronze, chrome plated.

Joints: Mechanical compression.

* + - * 1. Steel Pipe: ASTM A53 (Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless) Schedule 40, galvanized.

Fittings: Cast Iron, [**ASME B16.1, flanges and fittings;**] [**ASME B16.4, threaded fittings**].

Fittings: Malleable Iron, [**ASME B16.3, threaded type**] ASTM A47 (Standard Specification for Ferritic Malleable Iron Castings).

Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.

* + - * 1. Steel Pipe: ASTM A53 (Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless) Schedule 40, galvanized, [**cut**] [**rolled**] grooved ends.

Fittings: [**ASTM A395/A395M and ASTM A536 ductile iron,**] [**or**] [**ASTM A234/A234M carbon steel,**] grooved ends.

Joints: Grooved mechanical couplings meeting ASTM F1476 (Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications).

Housing Clamps: ASTM A395 (Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures) and ASTM A536 (Standard Specification for Ductile Iron Castings) ductile iron, [**enamel coated**] [**hot dipped galvanized**] <**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**>, compatible with steel piping sizes, [**rigid**] [**or**] [**flexible**] type.

Gasket: Elastomer composition for operating temperature range from [**-30**] [**86**] <**\_\_\_\_\_\_\_\_**> degrees F to [**230**] [**180**] <**\_\_\_\_\_\_\_\_**>degrees F.

Accessories: [**Steel**] [**Stainless steel**] bolts, nuts, and washers.

Plastics may not be approved in all situations. ABS has flame spread rating exceeding 25 and is not suitable in fire rated or non-combustible construction. PVC has flame spread less than 25 and with suitable fire stopping is generally approved for use in fire rated assemblies or through fire separations. Confirm use for this application and acceptance by authorities having jurisdiction.

* + - * 1. ABS Pipe: ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings) or ASTM F628 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core), Schedule 40, DWV, Acrylonitrile-Butadiene-Styrene (ABS) material.

Fittings: ABS, ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings).

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. ABS Pipe: ASTM D2661 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings) or ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings), Acrylonitrile-Butadiene-Styrene (ABS) material.

Fittings: ABS, ASTM D2661 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings).

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. PVC Pipe: ASTM D2729 (Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings), polyvinyl chloride (PVC) material.

Fittings: ASTM D2729 (Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings), PVC.

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) solvent cement.

* + - * 1. PVC Pipe: ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings), polyvinyl chloride (PVC) material.

Fittings: ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings), PVC.

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) solvent cement.

* + - * 1. PVC Pipe: ASTM D1785 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120) [**Schedule**] [**40**] [**80**] or ASTM D2241 (Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter) SDR-26 for not less than 150 psi pressure rating, polyvinyl chloride (PVC) material.

Fittings: [**ASTM D2466, Schedule 40, PVC**] [**ASTM D2467, Schedule 80, PVC**] [**ASTM D2464 PVC, threaded**].

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) Solvent cement.

* + - * 1. Fiberglass Pipe: ASTM D3262 (Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe), glass fiber reinforced thermosetting resin material.

Fittings: ASTM D3840 (Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications), glass fiber reinforced thermosetting resin.

Joints: Epoxy.

* + - * 1. Fiberglass Pipe: ASTM D3754 (Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe), ASTM D3517 (Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe), ASTM D2996 (Standard Specification for Filament-Wound Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe) and ASTM D2997 (Standard Specification for Centrifugally Cast Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe), glass fiber reinforced thermosetting resin material.

Fittings: Custom laminated Fiberglass.

Joints: Epoxy.

* + - 1. CHEMICAL RESISTANT SEWER PIPING
				1. Cast Iron Pipe: CISPI 301 (Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications), hubless, service weight.

Fittings: Cast iron, CISPI 301 (Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications).

Joints: CISPI 310 (Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications), neoprene gaskets and stainless steel clamp-and-shield assemblies.

* + - * 1. ABS Pipe: ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings) or ASTM F628 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core), Acrylonitrile-Butadiene-Styrene (ABS) material.

Fittings: ABS, ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings).

Joints: ASTM D2235 (Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings), solvent weld.

* + - * 1. PVC Pipe: ASTM D2729 (Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings) or ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings), polyvinyl chloride (PVC) material.

Fittings: PVC, ASTM D2729 (Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings) or ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings).

Joints: ASTM D2855 (Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings), solvent weld with ASTM D2564 (Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems) solvent cement.

* + - * 1. Glass Pipe: ASTM C1053 (Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications), borosilicate glass material.

Fittings: ASTM C1053 (Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications), borosilicate glass.

Joints: Stainless steel compression couplings with tetra-fluoroethylene seal ring.

* + - * 1. [**PP**] [**PPFR**] Pipe: Polypropylene [**, flame retardant**].

Fittings: Polypropylene.

Joints: Electrical resistance fusion.

* + - 1. UNIONS AND FLANGES
				1. Unions for Pipe 2 inches and Smaller:

Copper Piping: Class 150, bronze unions with [**soldered**] [**brazed joints**].

Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

PVC Piping: PVC.

* + - * 1. Flanges for Pipe 2-1/2 inches and Larger:

Copper Piping: Class 150, slip-on bronze flanges.

PVC Piping: PVC flanges.

Gaskets: 1/16 inch thick preformed neoprene gaskets.

* + - * 1. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464 (Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80), Schedule 80, threaded, PVC pipe.

Valves included in this section are those applicable to piping system. Numbers used in Section 220523 have been retained for ease of cross referencing. Possibly renumber valves after editing section for project.

* + - 1. GATE VALVES

In this paragraph, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=7944&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Milwaukee

Nibco

Stockham

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers' products specified above.

* + - * 1. [**GA-1**] 2 inches and Smaller: MSS SP 80 (Bronze Gate, Globe, Angle and Check Valves), [**Class 125**] [**Class 150**] <**\_\_\_\_\_\_\_\_**>, bronze body, bronze trim, [**threaded**] [**union**] bonnet, [**non-rising**] [**rising**] stem, [**lock-shield stem**] [**hand-wheel**], inside screw [**with back-seating stem**], [**solid**] [**split**] wedge disc, [**alloy seat rings,**] [**solder**] [**or**] [**threaded**] ends.
				2. [**GA-2**] 2-1/2 inches and Larger: MSS SP 70 (Cast Iron Gate Valves, Flanged and Threaded Ends), [**Class 125**] <**\_\_\_\_\_\_\_\_**>, cast iron body, bronze trim, bolted bonnet, [**rising**] [**non-rising**] stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.
			1. BALL VALVES

In this paragraph, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=7945&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Conbraco (Apollo)

Milwaukee

Nibco

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers' products specified above.

The following valve is economy type ball valve.

* + - * 1. [**BA-1**] 2 inches and Smaller: MSS SP 110 (Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends), [**400 psi WOG**] [**600 psi WOG**] <**\_\_\_\_\_\_\_\_**>, [**one**] [**two**] piece bronze body, chrome plated brass ball, [**regular**] [**full**] port, teflon seats, blow-out proof stem, [**solder**] [**or**] [**threaded**] ends [**with union**], [**lever handle**] [**wing or tee handle**] [**locking lever handle**] [**extended lever handle**] [**round handle**] [**oval handle**] [**with balancing stops**].
				2. [**BA-2**] 2 inches and Smaller: MSS SP 110 (Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends), [**Class 150**] <**\_\_\_\_\_\_\_\_**>, bronze, two piece body, [**chrome plated bronze**] [**type 316 stainless steel**] ball, [**regular**] [**full**] port, teflon seats, blow-out proof stem, [**solder**] [**or**] [**threaded**] ends [**with union**], [**lever handle**] [**wing or tee handle**] [**locking lever handle**] [**extended lever handle**] [**round handle**] [**oval handle**] [**with balancing stops**].

The following is ball valve with PVC body and trim.

* + - * 1. [**BA-6**] 2 inches and Smaller: 150 psi at 73 degrees F water temperature, maximum service temperature: 140 degrees F ASTM D1785 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120) PVC body and ball, double lever handle, [**EPDM**] [**fluorocarbon**] seals, teflon seats, [**regular**] [**full**] port, [**single**] [**double**] union type with [**socket**] [**threaded**] ends.
			1. CHECK VALVES
				1. Horizontal Swing Check Valves:

In this paragraph, list manufacturers acceptable for this Project.

[Manufacturers](http://www.specagent.com/LookUp/?ulid=8008&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Milwaukee

Nibco

Stockham

Or equal.

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

Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers' products specified above.

Use Buna-N type disc in water-oil-gas applications.

[**CK-1**] 2 inches and Smaller: MSS SP 80 (Bronze Gate, Globe, Angle and Check Valves), [**Class 150**] <**\_\_\_\_\_\_\_\_**>, bronze body and cap, bronze seat, Buna-N disc, [**solder**] [**or**] [**threaded**] ends.

[**CK-2**] 2-1/2 inches and Larger: MSS SP 71 (Cast Iron Swing Check Valves, Flanged and Threaded Ends), [**Class 125**] <**\_\_\_\_\_\_\_\_**>, cast iron body, bolted cap, bronze or cast iron disc, [**renewable disc seal and seat,**] flanged ends.

The following is check valve with lever and weight and lever and spring accessories.

[**CK-3**] 2-1/2 inches and Larger: MSS SP 71 (Cast Iron Swing Check Valves, Flanged and Threaded Ends), [**Class 125**] <**\_\_\_\_\_\_\_\_**>, cast iron body, bronze swing disc, [**renewable disc seal and seat,**] flanged ends, [**outside lever and weight**] [**outside lever and spring**].

* + - * 1. Spring Loaded Check Valves:

In this paragraph, list manufacturers acceptable for this Project.

[Manufacturers](http://www.specagent.com/LookUp/?ulid=8007&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Milwaukee

Nibco

Stockham

Or equal.

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

Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers' products specified above.

[**CK-6**] 2 inches and Smaller: MSS SP 80 (Bronze Gate, Globe, Angle and Check Valves), [**Class 250**] <**\_\_\_\_\_\_\_\_**>, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, [**solder**] [**or**] [**threaded**] ends.

[**CK-7**] 2-1/2 inches and Larger: MSS SP 71 (Cast Iron Swing Check Valves, Flanged and Threaded Ends), [**Class 125**] <**\_\_\_\_\_\_\_\_**>, [**wafer**] [**globe**] style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

* + - 1. PIPE HANGERS AND SUPPORTS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=7949&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

McMaster-Carr

L B & A, Inc.

Metraflex Co.

Panther Industries

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers' products specified above.

* + - * 1. Drain, Waste, and Vent: Conform to [**ASME B31.9**] [**ASTM F708**] [**MSS SP 58**] [**MSS SP 69**] [**MSS SP 89**].
				2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: [**Malleable iron**] [**Carbon steel**], adjustable swivel, split ring.
				3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
				4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
				5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hooks.
				6. Wall Support for Pipe Sizes 3 inches and Larger: Welded steel bracket and wrought steel clamp.
				7. Vertical Support: Steel riser clamp.
				8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
				9. Copper Pipe Support: Carbon-steel, copper-plated adjustable ring.
			1. FLOOR DRAINS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8036&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Josam Co.

Watts

Smith (Jay R.) Mfg. Co.

Zurn Industries, Inc.; Hydromechanics Div.

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Floor Drain (FD-1): ASME A112.21.1 (Floor Drains); [**lacquered**] [**galvanized**] cast iron two piece body with double drainage flange, weep holes, [**reversible clamping collar,**] and round, adjustable nickel-bronze strainer.

The following floor drain can be used in showers, washrooms, and general service areas. It is identical to FD-1; but, with sediment bucket and square strainer option.

* + - * 1. Floor Drain (FD-2): ASME A112.21.1 (Floor Drains); [**lacquered**] [**galvanized**] cast iron two piece body with double drainage flange, weep holes, [**reversible clamping collar,**] and round, adjustable [**round**] [**square**] nickel-bronze strainer with removable perforated sediment bucket.

The following floor drains can be used in equipment rooms and elsewhere for picking up indirect waste. It is identical to FD-1; but, with funnel or anti-splash rim on strainer.

* + - * 1. Floor Drain (FD-3): ASME A112.21.1 (Floor Drains); [**lacquered**] [**galvanized**] cast iron two piece body with double drainage flange, weep holes, [**reversible clamping collar,**] and round, adjustable nickel-bronze strainer with polished bronze funnel [**or anti- splash rim**].

The following floor drains can be used in warehouse areas and other areas where subject to high point loads. It is identical to FD-1; but, with extra heavy-duty strainers.

* + - * 1. Floor Drain (FD-4): ASME A112.21.1 (Floor Drains); [**lacquered**] [**galvanized**] cast iron two piece body with double drainage flange, weep holes, [**reversible clamping collar,**] and round, adjustable nickel-bronze extra heavy duty strainer.

The following drains can be used in vehicle areas. It is identical to FD-1; but, with extra heavy-duty strainers with hinged grate and sediment bucket.

* + - * 1. Floor Drain (FD-5): ASME A112.21.1 (Floor Drains); [**lacquered**] [**galvanized**] cast iron two piece body with double drainage flange, weep holes, [**reversible clamping collar,**] and round, adjustable nickel-bronze extra heavy duty strainer with hinged grate and sediment bucket.

The following trench drain can be used in parking areas and ramps, and where heavy traffic and large water volume occurs.

* + - * 1. Floor Drain (FD-6): [**Lacquered**] [**Galvanized**] cast iron two piece body with drainage flange, heavy duty grate [**6 inches**] [**12 inches**] wide, [**12 inches**] [**24 inches**] long, dome strainer, end plates with gaskets.
			1. FLOOR SINKS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8037&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Aqua Glass Corp.

Crane Plumbing/ Fiat products

Elkay Manufacturing Co.

Kohler Co

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Floor Sink (FS-1): [**Lacquered**] [**Galvanized**] cast iron body with dome strainer [**and seepage flange**].

The following floor sink can be used in food preparation and hospital areas.

* + - * 1. Floor Sink (FS-2): [**Round**] [**Square**] lacquered cast iron body with integral seepage pan, epoxy coated interior, [**aluminum**] <**\_\_\_\_\_\_\_\_**> dome strainer, [**clamp collar,**] [**sediment bucket,**] [**epoxy coated,**] [**nickel bronze frame and**] [**full**] [**half**] grate.
			1. PLANTER DRAINS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8038&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Josam

JR Smith

Zurn Industries

Or. equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

Lacquered finish is standard Strainer options depend upon water flow rate, soil type, type of material around drain, and service accessibility. Accessories pertain to deck type and installation conditions.

* + - * 1. ASME A112.21.1 (Floor Drains); [**lacquered**] [**galvanized**] cast iron body with sump.
				2. Strainer: Removable [**polyethylene**] [**cast metal**] [**cast aluminum**] [**cast bronze**] [**cast iron**] dome with [**stainless steel**] [**bronze**] screen.
				3. Accessories: Membrane flange and membrane clamp with integral gravel stops.
			1. CLEANOUTS
				1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8039&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Zurn Industries

Watts

Smith (Jay R.) Mfg. Co.

Josam Co.

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Exterior Surfaced Areas (CO-1): [**Round**] [**Square**] cast nickel bronze access frame and non-skid cover.
				2. Exterior Unsurfaced Areas (CO-2): Line type with lacquered cast iron body and round epoxy coated cover wit gasket.
				3. Interior Finished Floor Areas (CO-3): [**Lacquered**] [**Galvanized**] cast iron body with anchor flange, [**reversible clamping collar,**] threaded top assembly, and round scored cover with gasket in service areas and [**round**] [**square**] depressed cover with gasket to accept floor finish in finished floor areas.
				4. Interior Finished Wall Areas (CO-4): Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.
				5. Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.
			1. BACK WATER VALVES

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8040&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Ancon, Inc.

Josam Co.

Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Cast Iron: ASME A112.14.1 (Backwater Valves); [**lacquered**] [**galvanized**] cast iron body and cover, brass valve, [**6 inch extension sleeve,**] and access cover.
				2. Plastic: [**ABS**] [**PVC**] <**\_\_\_\_\_\_\_\_**> body and valve, [**6 inch extension sleeve,**] and access cover.
			1. SUMPS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8046&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

ABS Pumps, Inc.

Ashland Plastics, Inc.

Federal Pump Corp.

Fiberbasin, Inc.

Zoeller Co.

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

Cast-in-place concrete sumps for use on building site are not included in this Section. Specify in site utility section.

Minimum sump size allowed by code is 18 inches in diameter and 24 inches deep.

* + - * 1. [**Precast concrete specified in Section <\_\_\_\_\_\_\_\_>**] [**Precast concrete**] [**Epoxy coated fabricated steel**] [**Glass fiber reinforced**] [**encased with 8 inches concrete**] with required openings and drainage fittings.
				2. Cover: [**3/8 inch**] [**<\_\_\_\_\_\_\_\_> inch**] thick [**checkered steel**] <**\_\_\_\_\_\_\_\_**> plate with gasket seal frames and anchor bolts.
			1. GREASE INTERCEPTORS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8041&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

JR Smith

Watts Co.

Zurn Industries

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Comply with [**PDI G101**] [**ASME A112.14.3**] [**ASME A112.14.4**].
				2. Construction:

Material: [**Epoxy coated fabricated steel**] [**Stainless steel**] [**Precast concrete**].

Rough in: [**On floor**] [**Semi-recessed**] [**Fully recessed (shallow rough in)**] [**flush with floor (deep rough in)**] [**flush with floor (suspended) installation with anchor flange**].

* + - * 1. Accessories: Multi-weir baffle assembly, integral deep seal trap, removable integral flow control [**,**] [**sediment bucket**] <**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**>.
				2. Cover: Steel, epoxy coated, [**non-skid**] with gasket, securing handle, and enzyme injection port [**, recessed**] for [**floor finish**] [**tile**] [**terrazzo**] <**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**>.
				3. Unit Rating: <**\_\_\_\_\_\_\_\_**> gpm flow and <**\_\_\_\_\_\_\_\_**> lb. grease capacity.
			1. OIL INTERCEPTORS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8042&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

JR Smith

Watts Co.

Zurn Industries

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

The most common interceptor is fabricated steel type. For larger sizes and where solids are encountered, precast may be more appropriate.

* + - * 1. Construction:

Material: [**Epoxy coated fabricated steel**] [**Stainless steel**] [**Precast concrete**].

Rough in: [**On floor**] [**Semi-recessed**] [**Fully recessed (shallow rough-in)**] [**flush with floor (deep rough-in)**] [**flush with floor (suspended) installation with anchor flange**].

* + - * 1. Accessories: Integral deep seal trap, removable integral flow control, adjustable draw-off assembly, sediment bucket.
				2. Cover: Steel, epoxy coated, [**non-skid**] with gasket, securing handle, and enzyme injection port [**, recessed**] for [**floor finish**] [**tile**] [**terrazzo**] <**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**>.
				3. Unit Rating: <**\_\_\_\_\_\_\_\_**> gpm flow and <**\_\_\_\_\_\_\_\_**> lb. oil capacity.
			1. SEDIMENT INTERCEPTORS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8043&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

JR Smith

Schier Products

Zurn Industries

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

Cast iron interceptors are common in smaller manufactured sizes. Use stainless steel for corrosive fluids. Use precast for large sizes.

* + - * 1. [**Epoxy coated cast iron**] [**Stainless steel**] [**Precast concrete**] body and secured cover with removable stainless steel sediment bucket.

Catch Basins and Manholes may be specified in this section when appropriate for Project size and scope.

ASTM C478 refer to precast concrete manholes.

* + - 1. MANHOLES
				1. Formed Bottom Manholes: ASTM C478 (Standard Specification for Precast Reinforced Concrete Manhole Sections); [**concrete masonry units**] [**or**] [**reinforced precast concrete sections**] laid on cast-in-place reinforced concrete foundation pad as specified in Section 033000.

Size: [**48 inch**] [**<\_\_\_\_\_\_\_\_> inch**] diameter.

Cover: Standard cast iron with minimum sized pick hole, and frame. Use heavy-duty cover and frame in vehicular traffic areas.

Steps: 3/4 inch diameter [**galvanized steel**] [**or**] [**aluminum**] on 16 inch centers.

* + - 1. SEWAGE EJECTORS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8044&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Little Giant

Zoeller Company

Springer Pumps, LLC

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Type: Vertical centrifugal, direct connected, [**simplex**] [**duplex**] arrangement.
				2. Casing: Cast iron volute with radial clearance around impeller [**, slide away couplings**].

Sanitary service does not require strainer and must have open impeller. Cast iron or bronze impeller is generally a function of pump size and service. Use cast iron impellers where pump is continuously submerged.

* + - * 1. Impeller: [**Cast iron;**] [**Bronze;**] [**open non-clog,**] [**closed,**] keyed to [**corrosion resistant alloy steel**] [**stainless steel**] shaft.
				2. Support: Cast iron pedestal motor support on steel floor plate with gas tight gaskets.
				3. Bearings: [**Forced grease**] [**Oil**] lubricated bronze sleeve spaced maximum 48 inches and grease lubricated ball thrust at floor plate.
				4. Drive: Flexible coupling to vertical, solid shaft ball bearing electric motor.

Minimum sump size allowed by code is 18 inches in diameter and 24 inches deep.

* + - * 1. Sump: Steel cover plate [**with steel curb frame for grouting into concrete sump**] [**on steel sump basin**] with inspection opening and cover, and alarm fittings.

Select one of the following two paragraphs for control desired.

When both are required, for two different pumps, indicate in pump schedule. Controls listed are those most commonly applied to this type of pump. However, controls as specified for submersible units may be used in this type of installation.

* + - * 1. Controls (Simplex): Float switch with float rod, stops, and corrosion resistant float, and separate pressure switch high level alarm with transformer, alarm bell and stand-pipe.

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

* + - * 1. Controls (Duplex): Float operated mechanical alternator with float rod, stops, and corrosion resistant float to alternate operation of pumps. Cut-in second pump on rising level or lead pump failure. Furnish [**separate pressure switch high level alarm with transformer, alarm bell, and standpipe,**] [**and extra set of wired terminals for remote alarm circuit**] [**and emergency float switch with float rod, stops, and corrosion resistant float to operate both pumps on failure of alternator**].

Use the following paragraph for one or more identical pumps. Use the pump schedule when specifying pumps with different criteria.

* + - * 1. Performance:

Flow: <**\_\_\_\_\_\_\_\_**> gal/min, at <**\_\_\_\_\_\_\_\_**> feet lift.

* + - * 1. Electrical Characteristics and Components:

Select one or more of the following subparagraphs appropriate to equipment requirements.

Electrical Characteristics:

[**<\_\_\_\_\_\_\_\_>hp.**] [**<\_\_\_\_\_\_\_\_> rated load amperes.**]

<**\_\_\_\_\_\_\_\_**> volts, [**single**] [**three**] phase, 60 Hz.

<**\_\_\_\_\_\_\_\_**> amperes maximum [**fuse size**] [**circuit breaker size**] [**overcurrent protection**].

<**\_\_\_\_\_\_\_\_**> minimum circuit ampacity.

<**\_\_\_\_\_\_\_\_**> percent minimum power factor at rated load.

Motors: In accordance with Section 210513.

Disconnect Switch: Factory mount disconnect switch in [**control panel**] [**on equipment**].

* + - 1. SUBMERSIBLE SEWAGE EJECTORS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8045&mf=04&src=wd): Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Little Giant

Zoeller Company

Springer Pumps, LLC

Or equal.

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

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Type: Completely submersible, vertical, centrifugal.

The cast iron or bronze construction is generally a function of specific pump selection, and pump service. Use cast iron where pump is continuously submerged.

* + - * 1. Casing: [**Cast iron**] [**Bronze**] pump body and oil filled motor chamber.
				2. Impeller: [**Cast iron;**] [**Bronze;**] open non-clog, [**stainless steel**] [**corrosion resistant alloy steel**] shaft.
				3. Bearings: Ball bearings.

Minimum sump size allowed by code is 18 inches in diameter and 24 inches deep.

* + - * 1. Sump: Fiberglass basin with steel cover plate; <**\_\_\_\_\_\_\_\_**> inches diameter, <**\_\_\_\_\_\_\_\_**> inches deep.
				2. Accessories: Oil resistant [**6 foot**] [**<\_\_\_\_\_\_\_\_> foot**] cord and plug [**with three-prong connector**] for connection to electric wiring system [**including grounding connector**].
				3. Servicing: Slide-away coupling consisting of discharge elbow secure to sump floor, movable bracket, guide pipe system, lifting chain and chain hooks.

The following controls are generally only appropriate for single-phase motors up to one hp.

* + - * 1. Controls: Integral [**diaphragm**] [**mercury switch**] type level controls [**with separate, liquid-level, control high level alarm**].

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

The following controls are for pump motor installations larger than 1/2 hp and suitable for three phase electrical service.

* + - * 1. Controls: Motor control panel containing across-the-line electric motor starters with ambient compensated quick trip overloads in each phase with manual trip button and reset button, circuit breaker, control transformer, electro-mechanical alternator, hand-off-automatic selector switches, pilot lights, high water alarm pilot light, reset button and alarm horn. Furnish mercury switch liquid level controls, steel shell switch encased in polyurethane foam with cast iron weight for pump on (each pump), pump off (common), and alarm.

Use the following paragraph for one or more identical pumps. Use pump schedule when specifying pumps with different criteria.

* + - * 1. Performance:

Flow: <**\_\_\_\_\_\_\_\_**> gpm, at <**\_\_\_\_\_\_\_\_**> feet lift.

* + - * 1. Electrical Characteristics and Components:

Select one or more of the following subparagraphs appropriate to equipment requirements.

Electrical Characteristics: In accordance with Section 260503 and the following:

[**<\_\_\_\_\_\_\_\_>hp.**] [**<\_\_\_\_\_\_\_\_> rated load amperes.**]

<**\_\_\_\_\_\_\_\_**> volts, [**single**] [**three**] phase, 60 Hz.

<**\_\_\_\_\_\_\_\_**> amperes maximum [**fuse size**] [**circuit breaker size**] [**overcurrent protection**].

<**\_\_\_\_\_\_\_\_**> minimum circuit ampacity.

<**\_\_\_\_\_\_\_\_**> percent minimum power factor at rated load.

Motors: In accordance with Section 210513.

Disconnect Switch: Factory mount disconnect switch in [**control panel**] [**on equipment**].

1. EXECUTION
	* + 1. EXAMINATION
				1. Section 013000 - Administrative Requirements: Coordination and project conditions.
				2. Verify excavations are to required grade, dry, and not over-excavated.
			2. PREPARATION
				1. Ream pipe and tube ends. Remove burrs. [**Bevel plain end ferrous pipe.**]
				2. Remove scale and dirt, on inside and outside, before assembly.
				3. Prepare piping connections to equipment with flanges or unions.
				4. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
			3. INSTALLATION - HANGERS AND SUPPORTS
				1. Inserts:

Provide inserts for placement in concrete forms.

Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut [**above**] [**flush with top of**] [**recessed into and grouted flush with**] slab.

* + - * 1. Pipe Hangers and Supports:

Install in accordance with [**ASME B31.9**] [**ASTM F708**] [**and**] [**MSS SP 89**].

Support horizontal piping as scheduled.

Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

Place hangers within 12 inches of each horizontal elbow.

Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

Support vertical piping at every [**other**] floor. Support riser piping independently of connected horizontal piping.

Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.

Provide [**copper plated hangers and supports for copper piping**] [**sheet lead packing between hanger or support and piping**].

Manufactured hangers are normally supplied in black steel.

Prime coat exposed steel hangers and supports. [**Refer to Section 099000.**] Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

Install hangers adjacent to motor driven equipment with vibration isolation; refer to Section 210548.

* + - 1. INSTALLATION - BURIED PIPING SYSTEMS
				1. Verify connection [**to existing piping system**] <**\_\_\_\_\_\_\_\_**> size, location, and invert are as indicated on Drawings.
				2. Establish elevations of buried piping with not less than <**\_\_\_\_\_\_\_\_**> ft of cover.
				3. Establish minimum separation of <**\_\_\_\_\_\_\_\_**> from [**other services**] <**\_\_\_\_\_\_\_\_**> piping in accordance with <**\_\_\_\_\_\_\_\_**> code.

Edit the following based on piping material used.

* + - * 1. Remove scale and dirt on inside of piping before assembly.
				2. Install pipe to elevation [**as indicated on Drawings**] <**\_\_\_\_\_\_\_\_**>.
				3. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding [**4**] <**\_\_\_\_\_\_\_\_**> inches [**compacted**] [**loose**] depth; [**compact to [95] <\_\_\_\_\_\_\_\_> percent maximum density**].
				4. Install pipe on prepared bedding.
				5. Route pipe in straight line.
				6. Install plastic ribbon tape continuous [**over top of pipe.**] [**buried [6] <\_\_\_\_\_\_\_\_> inches below finish grade,**] above pipe line; Refer to Section [**220553**] <**\_\_\_\_\_\_\_\_**>.

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

Use the following paragraph for non-metallic pipe.

* + - * 1. Install trace wire continuous [**over top of pipe.**] [**buried [6] <\_\_\_\_\_\_\_\_> inches below finish grade,**] above pipe line; Refer to Section [**220553**] <**\_\_\_\_\_\_\_\_**>.
				2. Pipe Cover and Backfilling:

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

After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in [**4**] [**6**] inches compacted layers to [**6**] [**12**] inches minimum cover over top of jacket. Compact to [**95**] <**\_\_\_\_\_\_\_\_**> percent maximum density.

Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.

Do not use wheeled or tracked vehicles for tamping.

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

* + - * 1. Install Work in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.
			1. INSTALLATION - ABOVE GROUND PIPING

Some codes establish minimum slope based on pipe size. Specify here or indicate slope on Drawings.

* + - * 1. Establish invert elevations, slopes for drainage to [**1/4**] [**1/8**] [**1/16**] <**\_\_\_\_\_\_\_\_**> inch per foot minimum. Maintain gradients.
				2. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.
				3. Encase exterior cleanouts in concrete flush with grade.
				4. Install floor cleanouts at elevation to accommodate finished floor.
				5. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
				6. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
				7. Install piping to maintain headroom. Do not spread piping, conserve space.
				8. Group piping whenever practical at common elevations.
				9. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 220700.
				10. Provide access where valves and fittings are not accessible. [**Coordinate size and location of access doors with Section 083113.**]
				11. Install piping penetrating roofed areas to maintain integrity of roof assembly.
				12. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
				13. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 099114 and/or 099123
				14. Install bell and spigot pipe with bell end upstream.
				15. Sleeve pipes passing through partitions, walls and floors.
				16. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section [**078413**] [**220529**] <**\_\_\_\_\_\_\_\_**>.
				17. Support cast iron drainage piping at every joint.

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

* + - * 1. Install Work in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.
			1. INSTALLATION - PUMPS
				1. Provide pumps operating at specified system fluid temperatures without vapor binding and cavitation, non-overloading in parallel or individual operation, and operating within 25 percent of midpoint of published maximum efficiency curve.
				2. Provide shaft length allowing ejector pumps to be located minimum 24 inches below lowest invert into sump pit and minimum 6 inches clearance from bottom of sump pit.
				3. Provide air cock and drain connection on horizontal pump casings.
				4. Provide line sized [**gate**] [**ball**] valve, line sized [**soft seated**] [**lever and weight**] check valve, [**and**] [**balancing valve**] on pump discharge.
				5. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump independently of pump casings. Install supports under elbows on pump discharge line sizes 4 inches and larger.
				6. Check, align, and certify alignment of pumps prior to start-up.

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

* + - * 1. Install Work in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.
			1. FIELD QUALITY CONTROL
				1. Test sanitary waste and vent piping system in accordance with [**applicable code**] [**local authority having jurisdiction**] <**\_\_\_\_\_\_\_\_**>.
			2. SCHEDULES

Consider the following examples when developing Project schedule.

* + - * 1. Valve Service:

In following Subparagraphs indicate whether service is "shutoff," "throttling," or "check."

Pumped Sanitary Sewer: <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Sewage Ejectors:

SE-1:

Manufacturer: <**\_\_\_\_\_\_\_\_**>.

Model No.: <**\_\_\_\_\_\_\_\_**>.

Location: <**\_\_\_\_\_\_\_\_**>.

Service: <**\_\_\_\_\_\_\_\_**>.

Capacity: <**\_\_\_\_\_\_\_\_**>.

Head: <**\_\_\_\_\_\_\_\_**>.

Minimum Efficiency: <**\_\_\_\_\_\_\_\_**>.

Seal Type: <**\_\_\_\_\_\_\_\_**>.

Motor Size: <**\_\_\_\_\_\_\_\_**>.

Motor Voltage/Phase: <**\_\_\_\_\_\_\_\_**>/<**\_\_\_\_\_\_\_\_**>.

SE-2:

Manufacturer: <**\_\_\_\_\_\_\_\_**>.

Model No.: <**\_\_\_\_\_\_\_\_**>.

Location: <**\_\_\_\_\_\_\_\_**>.

Service: <**\_\_\_\_\_\_\_\_**>.

Capacity: <**\_\_\_\_\_\_\_\_**>.

Head: <**\_\_\_\_\_\_\_\_**>.

Minimum Efficiency: <**\_\_\_\_\_\_\_\_**>.

Seal Type: <**\_\_\_\_\_\_\_\_**>.

Motor Size: <**\_\_\_\_\_\_\_\_**>.

Motor Voltage/Phase: <**\_\_\_\_\_\_\_\_**>/<**\_\_\_\_\_\_\_\_**>.

Include schedule when pipe hanger spacing and size are not defined by code.

* + - * 1. Pipe Hanger Spacing:

Pipe Material: ABS.

Maximum Hanger Spacing: 4 feet

3/8 inch

Pipe Material: Aluminum.

Maximum Hanger Spacing: 10 feet

1/2 inch

Pipe Material: Cast iron.

Maximum Hanger Spacing: 5 feet

5/8 inch

Pipe Material: Cast iron, with 10-foot length of pipe.

Maximum Hanger Spacing: 10 feet

5/8 inch

Pipe Material: Copper tube.

Size: 1-1/4 inches and smaller.

Maximum Hanger Spacing: 6 feet

1/2 inch

Pipe Material: Copper tube.

Size: 1-1/2 inches and larger.

Maximum Hanger Spacing: 10 feet

1/2 inch

Pipe Material: Fiberglass.

Maximum Hanger Spacing: 4 feet

1/2 inch

Pipe Material: Glass.

Maximum Hanger Spacing: 8 feet

1/2 inch

Pipe Material: Polypropylene.

Maximum Hanger Spacing: 4 feet

3/8 inch

Pipe Material: PVC.

Maximum Hanger Spacing: 4 feet

3/8 inch

Pipe Material: Steel.

Size: 3 inches and smaller.

Maximum Hanger Spacing: 12 feet

1/2 inch

Pipe Material: Steel.

Size: 4 inches and larger.

Maximum Hanger Spacing: 12 feet

5/8 inch

END OF SECTION 221300