SECTION 221400 - FACILITY STORM DRAINAGE

This Section includes pipe, pipe fittings, connections, equipment and pumps normally encountered in storm water piping systems.

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

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting requirements of this Specification.

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:

Storm water piping buried beyond 5 feet of building.

Storm water piping buried within 5 feet of building.

Storm water piping above grade.

Unions and flanges.

Valves.

Pipe hangers and supports.

Roof drains.

Parapet drains.

Canopy and cornice drains.

Special purpose downspout covers.

Downspout nozzles.

Area drains.

Exterior planter drains.

Cleanouts.

Sumps.

Interceptors.

Catch basins.

Manholes.

Sump pumps.

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 099123- Painting and Coating: Execution requirements for painting material 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 A112.21.1- Floor Drains.

ASME A112.21.2 - Roof Drains.

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

ASTM B32 - Standard Specification for Solder Metal.

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 C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

ASTM D1785 - Standard Specification for (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 D2464 - Standard Specification for Threaded 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 D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

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

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

ASTM F679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

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

* + - * 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. 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 sump-pumps, catch basins 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.

Storm 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.

* + - * 1. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.
				2. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
			1. CLOSEOUT SUBMITTALS
				1. Project Record Documents: Record actual locations of equipment and cleanouts.
				2. Operation and Maintenance Data: Submit spare parts lists, exploded assembly views for pumps and equipment.
			2. QUALITY ASSURANCE
				1. Perform Work according to [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standard.

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 sump pump service facilities within 100 miles of Project**] [**, and with sump pump service facilities within <\_\_\_\_\_\_\_\_> miles of Project**].
				2. Installer: Company specializing in performing Work of this section with minimum three years' [**documented**] experience [**and approved by manufacturer**].
			2. PRE-INSTALLATION MEETINGS
				1. Convene minimum [**one week**] [**<\_\_\_\_\_\_\_\_> weeks**] 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 [**sump pumps**] <**\_\_\_\_\_\_\_\_**>.
			1. EXTRA MATERIALS
				1. Furnish [**two**] <**\_\_\_\_\_\_\_\_**> sets of [**pump seals**] <**\_\_\_\_\_\_\_\_**>.
1. PRODUCTS
	* + 1. STORM WATER 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 iron soil 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 Pipe: ASTM A74 (Standard Specification for Cast Iron Soil Pipe and Fittings), [**extra heavy**] [**service**] type, [**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 or lead and oakum.

Concrete pipe, unreinforced, 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**]; unreinforced, [**bell and spigot**] [**plain**] <**\_\_\_\_\_\_\_\_**> ends.

Fittings: Concrete.

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

Reinforced concrete pipe is normally used for larger diameter applications, for low pressure applications, or where subsoil pressure requires greater pipe strength than unreinforced 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 or expansive 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 offers 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. 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.

* + - * 1. Copper Tube: ASTM B306 (Standard Specification for Copper Drainage Tube (DWV)) DWV.

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 D3034 (Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings) SDR [**35**] <**\_\_\_\_\_\_\_\_**>, polyvinyl chloride (PVC) material.

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

Joints: ASTM F477 (Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe), elastomeric gaskets.

* + - * 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: 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), 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. STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

Cast iron soil 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 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 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), 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: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

Concrete pipe, unreinforced, 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**]; unreinforced, [**bell and spigot**] [**plain**] <**\_\_\_\_\_\_\_\_**> ends.

Fittings: Concrete.

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

Reinforced concrete pipe is normally used for larger diameter applications, for low pressure applications, or where subsoil pressure requires greater pipe strength than unreinforced 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 or expansive 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 offers 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. 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.

* + - * 1. Copper Tube: ASTM B306 (Standard Specification for Copper Drainage Tube (DWV)), DWV.

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. ABS Pipe: ASTM D2680 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping) or ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings), 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. 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. PVC Pipe: ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings), ASTM D3034 (Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings), or ASTM F679 (Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings), polyvinyl chloride (PVC) material.

Fittings: PVC, ASTM D2665 (Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings), ASTM D3034 (Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings), or ASTM F679 (Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings).

Joints: ASTM F477 (Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe), elastomeric gaskets.

* + - 1. STORM WATER PIPING, ABOVE GRADE
				1. Cast Iron 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), neoprene gasket system 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), 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: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

* + - * 1. Copper Tube: ASTM B306 (Standard Specification for Copper Drainage Tube (DWV)), DWV.

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. 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. ABS Pipe: ASTM D2680 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping) or ASTM D2751 (Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings), 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. 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: 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), 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. 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.

CPVC Piping: CPVC.

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

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

PVC Piping: PVC flanges.

CPVC Piping: CPVC 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 according to [**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, [**nonrising**] [**rising**] stem, [**lock-shield stem**] [**handwheel**], 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**] [**nonrising**] stem, handwheel, 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:

Conbroco (Apollo)

Milwaukee

Nibco

Or equal.

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

* + - * 1. Furnish materials according to [**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 (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 according to [**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 according to [**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

Metraflex Co.

Panther Industries

Or equal.

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

* + - * 1. Furnish materials according to [**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 Inch to 1-1/2 Inches: [**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 hook.
				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. ROOF DRAINS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8050&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, Inc.

Josam Co.

Jay R. Smith, Smith Industries, Inc.

Watts Industries, Inc.

Or equal.

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

* + - * 1. Furnish materials according to [**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. Dome strainer options are listed from most common and least costly, to least common and most costly. Most remaining options reflect adaptation of standard units to varying roofing and roof structure types.

* + - * 1. Roof Drain (RD-1):

Assembly: ASME A112.21.2.

Body: [**Lacquered**] [**Galvanized**] cast iron with sump.

Strainer: Removable [**polyethylene**] [**cast metal**] [**cast aluminum**] [**cast bronze**] [**cast iron**] dome [**with vandal proof screws**].

Accessories: Coordinate with roofing type, refer to Section <**\_\_\_\_\_\_\_\_**>:

Membrane flange and membrane clamp with integral gravel stop.

Adjustable under deck clamp.

Roof sump receiver.

Waterproofing flange.

Controlled flow weir.

Leveling frame.

Adjustable extension sleeve for roof insulation.

Perforated or slotted ballast guard extension for inverted roof.

Perforated stainless steel ballast guard extension.

The following is intended to be used for overflow or secondary roof drains.

* + - * 1. Roof Drain (RD-2):

Assembly: ASME A112.21.2.

Body: [**Lacquered**] [**Galvanized**] cast iron with sump.

Strainer: Removable [**polyethylene**] [**cast metal**] [**cast aluminum**] [**cast bronze**] [**cast iron**] dome [**with vandal proof screws**].

Pipe extended to <**\_\_\_\_\_\_\_\_**> inches above flood elevation.

Accessories: Coordinate with roofing type, refer to Section <**\_\_\_\_\_\_\_\_**>:

Membrane flange and membrane clamp with integral gravel stop.

Adjustable under deck clamp.

Roof sump receiver.

Waterproofing flange.

Controlled flow weir.

Leveling frame.

Adjustable extension sleeve for roof insulation.

Perforated or slotted ballast guard extension for inverted roof.

Perforated stainless steel ballast guard extension.

* + - 1. PARAPET DRAINS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8051&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:

Eaton

Marathon

Zurn Industries

Or equal.

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

* + - * 1. Furnish materials according to [**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. [**Lacquered**] [**Galvanized**] cast iron body with [**aluminum**] flashing clamp collar and [**epoxy coated**] [**nickel bronze**] [**sloping**] [**flush**] grate.
			1. CANOPY AND CORNICE DRAINS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8053&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 according to [**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. [**Lacquered**] [**Galvanized**] cast iron body with [**aluminum**] flashing clamp collar and [**epoxy coated**] [**nickel bronze**] flat strainer.
			1. SPECIAL PURPOSE DOWNSPOUT COVER

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8055&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:

Marathon

Watts Co

Zurn Industries

Or equal.

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

* + - * 1. Furnish materials according to [**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. Product Description: [**Brass**] [**Stainless steel**] with stainless steel mesh liner, vandal proof lock nut, and [**pipe clamp**] [**securing holes**].
			1. DOWNSPOUT NOZZLES

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8054&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 according to [**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. Product Description: [**Cast**] [**Nickel**] [**Polished**] bronze body and wall flange [**round**] with [**straight**] [**offset**] bottom section.
			1. AREA DRAINS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8052&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 according to [**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. Area Drain (AD-1): ASME A112.21.1; [**lacquered**] [**galvanized**] cast iron two piece body with double drainage flange, weep holes, [**reversible clamping collar,**] and round, adjustable nickel-bronze strainer.

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

* + - * 1. Area Drain (AD-2): [**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.

Lacquered finish is standard. Most remaining options pertain to deck or roof type.

* + - * 1. Area Drain (AD-3):

Assembly: ASME A112.21.1. Body: [**Lacquered**] [**Galvanized**] cast iron with sump. Strainer: [**Round**] [**Square**] nickel-bronze.

Accessories: Membrane flange and membrane clamp with integral gravel stop, with [**adjustable under deck clamp**] [**roof sump receiver**] [**waterproofing flange**] [**leveling frame**] [**adjustable extension sleeve (for insulation)**] [**perforated or slotted ballast guard extension for inverted roof**] [**perforated stainless steel ballast guard extension**].

* + - 1. EXTERIOR 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 according to [**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. Most of remaining options pertain to deck type.

* + - * 1. ASME A112.21.1; [**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. 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 with 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): Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.
			2. 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:

AK Industries, Inc.

Ashland Plastics, Inc.

Environment One Corp.

Federal Pump Corp.

Topp Industries, Inc.

Or equal.

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

* + - * 1. Furnish materials according to [**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 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. Sump: [**Precast concrete**] [**Epoxy coated fabricated steel**] [**Glass fiber reinforced**] [**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. 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 according to [**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. Sediment Interceptor: [**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.

* + - 1. CATCH BASINS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8049&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:

Western Industries Plastics Products

Zurn Industries

Zoeller Company

Or equal.

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

* + - * 1. Furnish materials according to [**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. Barrel: ASTM C478 (Standard Specification for Precast Reinforced Concrete Manhole Sections); precast concrete sections laid on cast-in-place reinforced concrete foundation pad, 36 inches or 48 inches diameter with precast concrete top.
				2. Inlet Assembly: Two-piece heavy-duty cast steel or cast iron frame and grate with ground or machined grate and frame bearing surfaces.

Curb and Gutter Style: Rectangular grate and storm back, capacity [**247 cu ft/s**] [**<\_\_\_\_\_\_\_\_> ft/s**].

Standard: Round frame and grate with capacity [**194 cu ft/s**] [**<\_\_\_\_\_\_\_\_> cu ft/s**].

Manhole Frame: Grated top, capacity [**141 cu ft/s**] [**<\_\_\_\_\_\_\_\_> cu ft/s**].

Construction with sloped bottom on sump is dependent upon local conditions and approvals.

* + - * 1. Minimum [**6 feet**] [**<\_\_\_\_\_\_\_\_> feet**] cover over outlet and [**slope bottom slab 10 percent to outlet invert**] [**minimum 2 feet sump below outlet**].
			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. SUMP PUMPS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8048&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:

Gorman-Rupp Co.

Grundfos Pumps, Inc.

Liberty Pumps

Weil Pump Co.

Zoeller Co.

Or equal.

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

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

Cast iron or bronze impeller is generally a function of pump size and service. Cast iron impellers should be 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 could 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 pump schedule when specifying pumps with different criteria.

* + - * 1. Performance:

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

Control: [**Simplex**] [**Duplex**].

* + - * 1. Electrical Characteristics and Components: According to Section 260503 and the following:

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

[**<\_\_\_\_\_\_\_\_>hp**] [**<\_\_\_\_\_\_\_\_> RLA**].

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

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

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

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

Motors: According to Section 210513.

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

* + - 1. SUBMERSIBLE SUMP PUMPS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8047&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:

Federal Pump Corp.

Goulds Pump, Inc.

Liberty Pumps

Weil Pump Co.

Zoeller Co.

Or equal.

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

* + - * 1. Furnish materials according to [**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. Pump 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;**] closed, [**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: According to Section 260503 and the following:

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

[**<\_\_\_\_\_\_\_\_>hp**] [**<\_\_\_\_\_\_\_\_> RLA**].

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

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

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

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

Motors: According to Section 16225.

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 according to [**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. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

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

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

* + - * 1. Install hangers and supports according to Section 220529.
			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**] [**sanitary sewer piping**] <**\_\_\_\_\_\_\_\_**> piping according to <**\_\_\_\_\_\_\_\_**> code.

Edit the following based on piping material used.

* + - * 1. Install pipe to elevation [**as indicated on Drawings**] <**\_\_\_\_\_\_\_\_**>.
				2. 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**] [**compact to <\_\_\_\_\_\_\_\_> percent maximum density**].
				3. Install pipe on prepared bedding.
				4. Route pipe in straight line.
				5. Install plastic ribbon tape continuous [**over top of pipe**] [**buried 6 inches below finish grade,**] [**buried <\_\_\_\_\_\_\_\_> 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,**] [**buried <\_\_\_\_\_\_\_\_> 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 according to [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.
			1. INSTALLATION - ABOVE GROUND PIPING
				1. Establish invert elevations, slopes for drainage to [**1/4**] [**1/8**] <**\_\_\_\_\_\_\_\_**> 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 clearance 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. Install 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. Group piping to conserve space.
				8. Group piping whenever practical at common elevations.
				9. Support cast iron drainage piping at every joint.
				10. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment..
				11. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 220700.
				12. Provide access where valves and fittings are not accessible. [**Coordinate size and location of access doors with Section 083113.**]
				13. Install piping penetrating roofed areas to maintain integrity of roof assembly.
				14. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
				15. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 099114 and/or 099123.
				16. Install bell and spigot pipe with bell end upstream.
				17. Sleeve pipes passing through partitions, walls and floors. Refer to Section 220529.
				18. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Section [**078413**] [**220529**] <**\_\_\_\_\_\_\_\_**>.

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

* + - * 1. Install Work according to [**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 according to [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.
			1. FIELD QUALITY CONTROL
				1. Test storm drainage piping system according to [**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 Storm Water: <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Sump Pumps:

SP-1:

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

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

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

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

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

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

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

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

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

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

SP-2:

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

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

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

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

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

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

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

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

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

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

Consider including following schedule if pipe hanger spacing and size is not defined by code.

* + - * 1. Pipe Hanger Spacing:

Pipe Material: ABS.

Maximum Hanger Spacing: 4 feet.

Hanger Rod Diameter: 3/8 inch.

Pipe Material: Aluminum.

Maximum Hanger Spacing: 10 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Material: Cast iron.

Maximum Hanger Spacing: 5 feet.

Hanger Rod Diameter: 5/8 inch.

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

Maximum Hanger Spacing: 6 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Material: Copper tube.

Size: 1-1/4 inches and smaller.

Maximum Hanger Spacing: 6 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Material: Copper tube.

Size: 1-1/2 inches and larger.

Maximum Hanger Spacing: 10 feet.

Hanger Rod Diameter: 1/2 inch.

Pipe Material: PVC.

Maximum Hanger Spacing: 4 feet.

Hanger Rod Diameter: 3/8 inch.

END OF SECTION 221400