SECTION 223200 - DOMESTIC WATER FILTRATION EQUIPMENT

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Bag-type filters.

Freestanding cartridge filters.

Off-floor cartridge filters.

Carbon filters.

Circulating sand filters.

Multimedia sand filters.

Greensand filters.

Separators.

* + - * 1. Related Sections:

Retain Section in subparagraph below that contains requirements Contractor might expect to find in this Section but are specified in another Section.

Section 221119 "Domestic Water Piping Specialties" for plumbing piping strainers.

* + - 1. PERFORMANCE REQUIREMENTS

Retain paragraph below with "Seismic Qualification Certificates" paragraph in "Informational Submittals" Article for projects requiring seismic design. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Verify requirements of authorities having jurisdiction.

* + - * 1. Seismic Performance: [**Bag-type filters,**] [**freestanding cartridge filters,**] [**carbon filters,**] [**circulating sand filters,**] [**multimedia sand filters,**] [**greensand filters,**] [**and**] [**separators**] shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

Retain subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means that "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product indicated. [Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for filters and separators.] [Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.]

Retain paragraph below only for multiple-unit systems using carbon or sand filters or separators.

* + - * 1. Shop Drawings: For water filtration equipment. Include plans, elevations, sections, details, and attachments to other work.

Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Retain subparagraph below if equipment includes wiring.

Wiring Diagrams: For power, signal, and control wiring.

Retain first paragraph below if required by seismic criteria applicable to Project. Coordinate with Sections specifying mechanical vibration, supports, and seismic controls. See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Certificates: For [**bag-type filters,**] [**freestanding cartridge filters,**] [**carbon filters,**] [**circulating sand filters,**] [**multimedia sand filters,**] [**greensand filters,**] [**separators,**] accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Retain first paragraph below only if required.

* + - * 1. Certificates of Shop Inspections and Data Reports: For products required to have ASME label, signed by product manufacturer.

Retain first paragraph below if retaining procedures for welder certification in "Quality Assurance" Article.

* + - * 1. Welding certificates.
				2. Source quality-control reports.
				3. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For water filtration equipment to include in emergency, operation, and maintenance manuals.
			2. MATERIALS MAINTENANCE SUBMITTALS

Extra materials may not be allowed for publicly funded projects.

* + - * 1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Bag-Type Filter Bags: Bags for bag-type filters equal to [**200**] [**400**] <**Insert number**> percent of amount installed for each size and media indicated.

Cartridge-Filter Elements: Elements for cartridge filters equal to [**200**] [**400**] <**Insert number**> percent of amount installed for each size and media indicated.

* + - 1. QUALITY ASSURANCE
				1. Source Limitations: Obtain each type of water filtration equipment through one source from a single manufacturer.

Retain "Welding Qualifications" paragraph below if shop or field welding is required. If retaining, also retain "Welding certificates" paragraph in "Informational Submittals" Article.

* + - * 1. Welding Qualifications: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code.
				2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
				3. Comply with NSF 61 Annex, "Drinking Water System Components - Health Effects," for all components that will be in contact with potable water.
			1. PROJECT CONDITIONS
				1. Feedwater Analysis:

Alkalinity: <**Insert ppm**>.

Arsenic: <**Insert ppm**>.

Calcium: <**Insert ppm**>.

Chlorine: <**Insert ppm**>.

Color: <**Insert nephelometric turbidity units**>.

Hydrogen-Ion Concentration: <**Insert pH**>.

Hardness: <**Insert ppm**>.

Hydrogen Sulfide: <**Insert ppm**>.

Iron: <**Insert ppm**>.

Lead: <**Insert ppm**>.

Magnesium: <**Insert ppm**>.

Manganese: <**Insert ppm**>.

Potassium: <**Insert ppm**>.

Sand: <**Insert ppm**>.

Silt: <**Insert ppm**>.

Sodium: <**Insert ppm**>.

Total Dissolved Solids: <**Insert ppm**>.

Turbidity: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

* + - * 1. Feedwater Properties:

Inlet Water Pressure: <**Insert psig**>.

Water Temperature: <**Insert deg F**>.

* + - 1. COORDINATION
				1. Coordinate size and location of concrete bases with actual equipment provided.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. BAG-TYPE FILTERS
				1. Description: Simplex, floor-mounted housing with [**single-bag filter**] [**multiple-bag filter**] for removing suspended particles from water.

Housing: Corrosion resistant; designed to separate feedwater from filtrate and to direct feedwater through bag-type water filter(s); with bag support and base, feet, or skirt.

Retain "Material" subparagraph below unless multiple filter types are scheduled on Drawings. Stainless-steel housing material is most commonly used.

Material: [**Carbon steel with NSF 61 Annex lining material**] [**Plastic**] [**Stainless steel**].

Seals: [**NBR**] <**Insert material**>.

Bag Support: Top lock ring and perforated [**stainless-steel**] <**Insert material**> basket.

Pipe Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “Pipe Threads, General Purpose, Inch”.

Steel Housing Pipe Connections NPS 2-1/2 and Larger: Steel, Class 150 flanges according to ASME B16.5 “Pipe Flanges & Flanged Fittings” or grooved according to AWWA C606 “Standard for Grooved and Shouldered Joints”. Provide stainless-steel flanges if housing is stainless steel.

Plastic Housing Pipe Connections NPS 2-1/2 and Larger: 150-psig plastic flanges.

Bag: Replaceable; of shape to fit housing.

If more than one single-bag-type filter is required on Project, delete paragraph below and schedule bag-type filters on Drawings.

* + - * 1. Capacity and Characteristics:

Filtrate Design Concentrations:

Retain only required data in list below; insert other data as needed.

Alkalinity: <**Insert ppm**>.

Chlorine: <**Insert ppm**>.

Color: <**Insert nephelometric turbidity units**>.

Hydrogen Sulfide: <**Insert ppm**>.

Iron: <**Insert ppm**>.

Manganese: <**Insert ppm**>.

Sand: <**Insert ppm**>.

Silt: <**Insert ppm**>.

Turbidity: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

Filter Design:

Continuous Flow: <**Insert gpm**>.

Peak Flow: <**Insert gpm**>.

Filtration Efficiency: [**98**] <**Insert number**> percent retention of suspended particles [**10**] [**20**] <**Insert size**> micrometers and larger from feedwater of listed filtrate design concentrations.

Pressure Drop: Not to exceed [**2 psig**] <**Insert value**> at filter design flow rate when clean[**and** <**Insert value**> **when dirty**].

Housing:

Pressure Rating: <**Insert psig**>.

Diameter: <**Insert inches**>.

Height or Length: <**Insert inches**>.

Inlet and Outlet Size: <**Insert NPS**>.

Drain Size: [**Not applicable**] <**Insert NPS**>.

Bag:

Nominal Diameter: <**Insert inches**>.

Nominal Length: <**Insert inches**>.

Media: [**Cotton**] [**Polyester**] [**PP**] <**Insert material**>; [**felt, filament, or mesh**] [**felt**] [**filament**] [**mesh**] construction.

* + - 1. CARTRIDGE FILTERS
				1. Freestanding Cartridge Filters:

Description: Simplex, floor-mounted housing with replaceable element(s) for removing suspended particles from water.

Housing: Corrosion resistant; designed to separate feedwater from filtrate and to direct feedwater through water filter element(s); with element support(s) and base, feet, or skirt.

Retain first subparagraph below for projects in seismic areas.

Fabricate supports and base, feet, or skirt and attachment to housing with reinforcement strong enough to resist filter movement during a seismic event when filter base is anchored to building structure.

Pipe Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “Pipe Threads, General Purpose, Inch”.

Steel Tank Pipe Connections NPS 2-1/2 and Larger: Steel, Class 150 flanges according to ASME B16.5 “Pipe Flanges & Flanged Fittings” or grooved according to AWWA C606 “Standard for Grooved and Shouldered Joints”. Provide stainless-steel flanges if housing is stainless steel.

Plastic Housing Pipe Connections NPS 2-1/2 and Larger: 150-psig plastic flanges.

Element(s): Replaceable; of shape to fit housing.

If more than one freestanding cartridge filter is required on Project, delete subparagraph below and schedule cartridge filters on Drawings.

Capacity and Characteristics:

Filtrate Design Concentrations:

Retain only required data in list below; insert other data as needed.

Alkalinity: <**Insert ppm**>.

Chlorine: <**Insert ppm**>.

Color: <**Insert nephelometric turbidity units**>.

Hydrogen Sulfide: <**Insert ppm**>.

Iron: <**Insert ppm**>.

Manganese: <**Insert ppm**>.

Sand: <**Insert ppm**>.

Silt: <**Insert ppm**>.

Turbidity: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

Filter Design:

Continuous Flow: <**Insert gpm**>.

Peak Flow: <**Insert gpm**>.

Filtration Efficiency: [**98**] <**Insert number**> percent retention of suspended particles [**1**] [**10**] [**20**] <**Insert size**> micrometers and larger from feedwater of listed filtrate design concentrations.

Pressure Drop: Not to exceed [**2 psig**] <**Insert value**> at filter design flow rate when clean[**and** <**Insert value**> **when dirty**].

Housing:

Material: [**Plastic**] [**Stainless steel**] <**Insert material**>.

Pressure Rating: <**Insert psig**>.

Seals: [**NBR**] <**Insert material**>.

Diameter: <**Insert inches**>.

Height or Length: <**Insert inches**>.

Inlet and Outlet Size: <**Insert NPS**>.

Drain Size: [**Not applicable**] <**Insert NPS**>.

Elements:

Number Required: [**One**] [**Two**] <**Insert number**>.

Nominal Diameter: <**Insert inches**>.

Nominal Length: <**Insert inches**>.

Retain one of four subparagraphs below.

Media: [**Activated charcoal**] [**or**] [**ground charcoal**].

Media: [**Pleated polyester**] [**or**] [**pleated PP**].

Media: [**Wound polyester**] [**or**] [**wound PP**].

Media: <**Insert material**>.

* + - * 1. Off-Floor Cartridge Filters:

Description: Simplex, [**in-line**] [**wall-mounted**] housing with replaceable element for removing suspended particles from water.

Housing: Corrosion resistant; designed to separate feedwater from filtrate and to direct feedwater through water filter element; with element support.

Pipe Connections: Threaded according to ASME B1.20.1 “Standard for Grooved and Shouldered Joints”.

Retain first subparagraph below only if filters are wall-mounted type.

Support: Wall bracket.

Element: Replaceable; of shape to fit housing.

If more than one off-floor cartridge filter is required on Project, delete subparagraph below and schedule cartridge filters on Drawings.

Capacity and Characteristics:

Filtrate Design Concentrations:

Retain only required data in list below; insert other data as needed.

Alkalinity: <**Insert ppm**>.

Chlorine: <**Insert ppm**>.

Color: <**Insert nephelometric turbidity units**>.

Hydrogen Sulfide: <**Insert ppm**>.

Iron: <**Insert ppm**>.

Manganese: <**Insert ppm**>.

Sand: <**Insert ppm**>.

Silt: <**Insert ppm**>.

Turbidity: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

Filter Design:

Continuous Flow: <**Insert gpm**>.

Peak Flow: <**Insert gpm**>.

Filtration Efficiency: [**98**] <**Insert number**> percent retention of suspended particles [**1**] [**10**] [**20**] <**Insert size**> micrometers and larger from feedwater of listed filtrate design concentrations.

Pressure Drop: Not to exceed [**2 psig**] <**Insert value**> at filter design flow rate when clean[**and** <**Insert value**> **when dirty**].

Housing:

Material: [**PE or PP**] [**Plastic**] [**Stainless steel**] <**Insert material**>.

Pressure Rating: <**Insert psig**>.

Seals: [**NBR**] <**Insert material**>.

Diameter: <**Insert inches**>.

Height or Length: <**Insert inches**>.

Inlet and Outlet Size: <**Insert NPS**>.

Drain Size: [**Not applicable**] <**Insert NPS**>.

Element:

Nominal Diameter: <**Insert inches**>.

Nominal Length: <**Insert inches**>.

Retain one of four subparagraphs below.

Media: [**Activated charcoal**] [**or**] [**ground charcoal**].

Media: [**Pleated polyester**] [**or**] [**pleated PP**].

Media: [**Wound polyester**] [**or**] [**wound PP**].

Media: <**Insert material**>.

* + - 1. CARBON FILTERS
				1. Description: Simplex carbon filter, with media tank, media, and automatic backwash for [**removing chlorine from**] [**and**] [**improving color, odor, and taste of**] <**Insert application**> water.

Media Tank: Corrosion resistant with distribution system and media.

Construction:

Retain first subparagraph below to require steel or stainless-steel tanks to be ASME labeled; delete for non-code construction.

Fabricate and label steel filter tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

Retain first subparagraph below to require FRP tanks to be ASME labeled; delete for non-code construction.

Fabricate and label FRP filter tanks to comply with ASME Boiler and Pressure Vessel Code, Section X, if indicated.

Retain first subparagraph below for projects in seismic areas.

Fabricate supports and base and attachment to tank with reinforcement strong enough to resist filter movement during a seismic event when filter base is anchored to building structure.

Pipe Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “Pipe Threads, General Purpose, Inch”.

Steel Tank Pipe Connections NPS 2-1/2 and Larger: Steel, Class 150 flanges according to ASME B16.5 “Pipe Flanges & Flanged Fittings” or grooved according to AWWA C606 “Standard for Grooved and Shouldered Joints”. Provide stainless-steel flanges if tank is stainless steel.

FRP Tank Pipe Connections NPS 2-1/2 and Larger: Type A, integral; [**Designation E, 125-psig**] [**or**] [**Designation F, 150-psig**] pressure category flanges of grade same as tank material according to ASTM D5421 “Standard Specification for Contact Molded "Fiberglass" Flanges”.

Support: Base, feet, or skirt.

Controls: Automatic for control of backwash; factory wired for single, external electrical connection.

Panel: NEMA 250 “Enclosures for Electrical Equipment”, Type [**4**] <**Insert type**> enclosure.

Backwash Initiation Device: [**Differential pressure gages**] [**Electric time clock**] [**Water meter**].

If more than one carbon filter is required on Project, delete paragraph below and schedule carbon filters on Drawings.

* + - * 1. Capacity and Characteristics:

Filtrate Design Concentrations:

Retain only required data in list below. For public utility water, only chlorine concentration may be required. For water from a well, all or most data may be required.

Alkalinity: <**Insert ppm**>.

Chlorine: <**Insert ppm**>.

Color: <**Insert nephelometric turbidity units**>.

Hydrogen-Ion Concentration: <**Insert pH**>.

Hydrogen Sulfide: <**Insert ppm**>.

Iron: <**Insert ppm**>.

Manganese: <**Insert ppm**>.

Total Dissolved Solids: <**Insert ppm**>.

Turbidity: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

Filter Design:

Continuous Flow: <**Insert gpm**>.

Flow Rate: <**Insert gpm/sq. ft.**> of media cross-sectional area.

Peak Flow: <**Insert gpm**>.

Filtration Efficiency: [**98**] <**Insert number**> percent retention of suspended particles [**20**] [**40**] <**Insert size**> micrometers and larger from feedwater of listed filtrate design concentrations.

Pressure Drop: Not to exceed [**2 psig**] <**Insert value**> at filter design flow rate when clean[**and** <**Insert value**> **when dirty**].

Backwash Flow: <**Insert gpm**>.

Retain one of first three subparagraphs below to match backwash initiation device selected above.

Filter Backwash Interval: <**Insert psig**> pressure drop measured by differential pressure gages.

Filter Backwash Interval: <**Insert number**> days measured by time clock.

Filter Backwash Interval: <**Insert gal.**> measured by water meter.

Media Tank:

Material: [**Carbon steel with NSF 61 Annex lining material**] [**FRP**] [**Stainless steel**].

Pressure Rating: <**Insert psig**>.

Media: [**Activated charcoal**] [**Ground charcoal**] <**Insert material**>.

Media Quantity: <**Insert cu. ft.**>.

Diameter: <**Insert inches**>.

Height: <**Insert inches**>.

Inlet and Outlet Size: <**Insert NPS**>.

Unit Electrical Characteristics:

Volts: [**120**] [**240**] [**277**] [**480**] <**Insert value**>.

Phase: [**Single**] [**Three**].

Hertz: [**60**] <**Insert value**>.

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**>.

* + - 1. SAND FILTERS
				1. Circulating Sand Filters:

Description: Factory-fabricated and -tested, simplex, sand-filter system of filter tank, media, strainer, circulating pump, piping, and controls for removing sediment particles from water.

Filter Tank: Corrosion resistant with distribution system and media.

Construction:

Retain first subparagraph below to require steel or stainless-steel tanks to be ASME labeled; delete for non-code construction.

Fabricate and label steel filter tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

Retain first subparagraph below to require FRP tanks to be ASME labeled; delete for non-code construction.

Fabricate and label FRP filter tanks to comply with ASME Boiler and Pressure Vessel Code, Section X, if indicated.

Retain first subparagraph below for projects in seismic areas.

Fabricate supports and base and attachment to tank with reinforcement strong enough to resist filter movement during a seismic event when filter base is anchored to building structure.

Pipe Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “Pipe Threads, General Purpose, Inch”.

Steel Tank Pipe Connections NPS 2-1/2 and Larger: Steel, Class 150 flanges according to ASME B16.5 “Pipe Flanges & Flanged Fittings” or grooved according to AWWA C606 “Standard for Grooved and Shouldered Joints”.

FRP Tank Pipe Connections NPS 2-1/2 and Larger: Type A, integral; Designation [**E, 125-psig**] [**or**] [**F, 150-psig**] pressure category flanges of grade same as tank material according to ASTM D5421 “Standard Specification for Contact Molded "Fiberglass" Flanges”.

Strainer: Basket type.

Pipe Connections:

Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “Pipe Threads, General Purpose, Inch”.

Connections NPS 2-1/2 and Larger: Cast-iron, Class 125 flanges according to ASME B16.1 “Gray Iron Pipe Flanges and Flanges Fittings Classes 25, 125 and 250”.

Retain one of first two subparagraphs below.

Piping: [**Galvanized steel pipe, galvanized cast-iron fittings**] [**Stainless-steel pipe, stainless-steel fittings**], and flanged, grooved, or threaded joints.

Piping: ASTM B88 “Standard Specification for Seamless Copper Water Tube”, Type L copper water tube, copper-alloy solder-joint fittings, and brazed, flanged, or grooved joints.

Safety Valves: Automatic and manual pressure relief.

Circulating Pump: Overhung impeller, close coupled, single stage, end suction, centrifugal. Comply with UL 778 “Standard for Safety Motor-Operated Water Pumps” and with HI 1.1-1.2 and HI 1.3.

Pump Construction: Bronze fitted.

Casing: Radially split, cast iron.

Pressure Rating: [**125 psig**] [**150 psig**] minimum.

Impeller: ASTM B584 “Standard Specification for Copper Alloy Sand Castings for General Applications”, cast bronze; statically and dynamically balanced, closed, and keyed to shaft.

Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.

Seal: Mechanical.

Motor characteristics such as NEMA designation, temperature rating, service factor, enclosure type, and efficiency are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment." If different characteristics are required, insert subparagraphs below to suit Project.

Motor: General requirements for motors are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

Controls: Automatic for control of circulating pump and tank backwash; factory wired for single, external electrical connection.

Panel: NEMA 250 “Enclosures for Electrical Equipment”, Type [**4**] <**Insert type**> enclosure with time clock and pressure gages.

Pump: Automatic and manual.

Backwash: Automatic; with [**time-clock**] [**differential-pressure-switch**] initiation device.

Backwash Valve: Tank mounted.

Support: Skid mounting.

If more than one circulating sand filter is required on Project, delete subparagraph below and schedule sand filters on Drawings.

Capacity and Characteristics:

Filtrate Design Concentrations:

Sand: <**Insert ppm**>.

Silt: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

Filter Design:

Continuous Flow: <**Insert gpm**> at [**5-psig**] <**Insert value**> pressure drop.

Flow Rate: <**Insert gpm/sq. ft.**> of media cross-sectional area.

Peak Flow: <**Insert gpm**>.

Filtration Efficiency: [**98**] <**Insert number**> percent removal of [**1.8**] <**Insert number**> minimum specific-gravity suspended particles [**5**] [**10**] [**20**] [**45**] <**Insert size**> micrometers and larger from feedwater of listed filtrate design concentrations.

Filter Tank: With internal distribution piping.

Material: [**Carbon steel with NSF 61 Annex lining material**] [**FRP**] <**Insert material**>.

Pressure Rating: <**Insert psig**>.

Diameter: <**Insert inches**>.

Height: <**Insert inches**>.

Inlet and Outlet Size: <**Insert NPS**>.

Purge Size: <**Insert NPS**>.

Filter Media: [**Graded silica sand**] <**Insert media**>.

Retain one of first two subparagraphs below to match backwash initiation device selected above.

Filter Backwash Interval: <**Insert psig**> pressure drop measured by differential pressure gages.

Filter Backwash Interval: <**Insert number**> days measured by time clock.

Circulating Pump:

Capacity: <**Insert gpm**>.

Total Dynamic Head: <**Insert feet**>.

Speed: <**Insert rpm**>.

Inlet Size: <**Insert NPS**>.

Outlet Size: <**Insert NPS**>.

Pump Motor Size and Electrical Characteristics:

Horsepower: <**Insert value**>.

Volts: [**120**] [**208**] [**240**] [**277**] [**480**] <**Insert value**>.

Phase: [**Single**] [**Three**].

Hertz: [**60**] <**Insert value**>.

Unit Electrical Characteristics:

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**>.

* + - * 1. Multimedia Sand Filters:

Description: Factory-fabricated and -tested, [**simplex**] [**duplex**] [**triplex**], multimedia, sand-filter system of filter tank(s), media, piping, and controls for removing sediment particles from water.

Tank Construction:

Retain first subparagraph below to require steel or stainless-steel tanks to be ASME labeled; delete for non-code construction.

Fabricate and label steel filter tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

Retain first subparagraph below to require FRP tanks to be ASME labeled; delete for non-code construction.

Fabricate and label FRP filter tanks to comply with ASME Boiler and Pressure Vessel Code, Section X, if indicated.

Retain first subparagraph below for projects in seismic areas.

Fabricate supports and base and attachment to tank with reinforcement strong enough to resist filter movement during a seismic event when filter base is anchored to building structure.

Pipe Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “B1.20.1: Pipe Threads, General Purpose, Inch”.

Steel Tank Pipe Connections NPS 2-1/2 and Larger: Steel, Class 150 flanges according to ASME B16.5 “Pipe Flanges & Flanged Fittings” or grooved according to AWWA C606 “Standard for Grooved and Shouldered Joints”.

FRP Tank Pipe Connections NPS 2-1/2 and Larger: Type A, integral; Designation [**E, 125-psig**] [**or**] [**F, 150-psig**] pressure category flanges of grade same as tank material according to ASTM D5421.

Service Valve(s): Diaphragm type [**hydraulically**] [**pneumatically**] operated.

Retain one of first three subparagraphs below.

Piping: [**Galvanized steel pipe, galvanized cast-iron fittings**] [**Stainless-steel pipe, stainless-steel fittings**], and flanged, grooved, or threaded joints.

Piping: ASTM B88 “Standard Specification for Seamless Copper Water Tube”, Type L copper water tube, copper-alloy solder-joint fittings, and brazed, flanged, or grooved joints.

Piping: Schedule 80 ABS or PVC pipe and fittings with solvent-cemented joints.

Safety Valves: Automatic air vent.

Retain one or both of first two subparagraphs below.

Controls for Simplex Tank System: Automatic, electric time clock for control of filter system flow and backwash cycles; factory-wired for single, external electrical connection.

Controls for [**Duplex**] [**Triplex**] Tank System: Automatic, electric time clock for control of filter system flow and backwash cycles; factory-wired for single, external electrical connection. System operation shall be continuous with bypass piping and not more than one tank in backwash cycle at same time.

Support: Skid mounting.

If more than one multimedia sand filter is required on Project, delete subparagraph below and schedule sand filters on Drawings.

Capacity and Characteristics:

Filtrate Design Concentrations:

Retain only required data in list below; insert other data as needed.

Chlorine: <**Insert ppm**>.

Color: <**Insert nephelometric turbidity units**>.

Iron: <**Insert ppm**>.

Manganese: <**Insert ppm**>.

Total Dissolved Solids: <**Insert ppm**>.

Turbidity: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

Filter Design:

Continuous Flow: <**Insert gpm**> at <**Insert psig**> pressure drop.

Peak Flow: <**Insert gpm**> at <**Insert psig**> pressure drop.

Filtration Efficiency: [**98**] <**Insert number**> percent removal of suspended particles [**10**] [**20**] [**40**] <**Insert size**> micrometers and larger from feedwater of listed filtrate design concentrations.

Backwash Flow: <**Insert gpm**> at <**Insert psig**> pressure drop.

Retain one of first two subparagraphs below.

Media Tank: Single with controls.

Media Tanks: [**Two**] [**Three**] with manifolded inlet, outlet, and drain piping and controls.

Each Media Tank:

Material: [**Carbon steel with NSF 61 Annex lining material**] [**FRP**] <**Insert material**>.

Pressure Rating: <**Insert psig**> minimum.

Distribution System: Factory-installed plastic.

Temperature Rating: <**Insert deg F**> minimum.

Diameter: <**Insert inches**>.

Height: <**Insert inches**>.

Service Valve Size: <**Insert NPS**>.

Inlet and Outlet Size: <**Insert NPS**>.

Drain Size: <**Insert NPS**>.

Filter Media: [**Graded silica sand**] <**Insert media**>.

* + - * 1. Greensand Filters:

Description: Greensand-filter system of piping, and controls for removing [**iron**] [**iron and manganese**] [**manganese**] from water.

Tank Construction:

Retain first subparagraph below to require steel or stainless-steel tanks to be ASME labeled; delete for non-code construction.

Fabricate and label steel filter tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

Retain first subparagraph below to require FRP tanks to be ASME labeled; delete for non-code construction.

Fabricate and label FRP filter tanks to comply with ASME Boiler and Pressure Vessel Code, Section X, if indicated.

Retain first subparagraph below for projects in seismic areas.

Fabricate supports and base and attachment to tank with reinforcement strong enough to resist filter movement during a seismic event when filter base is anchored to building structure.

Pipe Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “Pipe Threads, General Purpose, Inch”.

Steel Tank Pipe Connections NPS 2-1/2 and Larger: Steel, Class 150 flanges according to ASME B16.5 “Pipe Flanges & Flanged Fittings” or grooved according to AWWA C606 “Standard for Grooved and Shouldered Joints”.

FRP Tank Pipe Connections NPS 2-1/2 and Larger: Type A, integral; Designation [**E, 125-psig**] [**or**] [**F, 150-psig**] pressure category flanges of grade same as tank material according to ASTM D5421 “Standard Specification for Contact Molded "Fiberglass" Flanges”.

Service Valve(s): Diaphragm type [**hydraulically**] [**pneumatically**] operated.

Retain one of first three subparagraphs below.

Piping: [**Galvanized steel pipe, galvanized cast-iron fittings**] [**Stainless-steel pipe, stainless-steel fittings**], and flanged, grooved, or threaded joints.

Piping: ASTM B88 “Standard Specification for Seamless Copper Water Tube”, Type L copper water tube, copper-alloy solder-joint fittings, and brazed, flanged, or grooved joints.

Piping: Schedule 80 ABS or PVC pipe and fittings with solvent-cemented joints.

Safety Valves: Automatic air vent.

Retain one or both of first two subparagraphs below.

Controls for Simplex Tank System: Automatic, electric time clock for control of filter system flow and backwash cycles; factory wired for single, external electrical connection.

Controls for [**Duplex**] [**Triplex**] Tank System: Automatic, electric time clock for control of filter system flow and backwash cycles; factory wired for single, external electrical connection. System operation shall be continuous with bypass piping and not more than one tank in backwash cycle at same time.

Support: Skid mounting.

If more than one greensand filter is required on Project, delete subparagraph below and schedule sand filters on Drawings.

Capacity and Characteristics:

Filtrate Design Concentrations:

Iron: <**Insert ppm**>.

Manganese: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

Filter Design:

Continuous Flow: <**Insert gpm**> at <**Insert psig**> pressure drop.

Peak Flow: <**Insert gpm**> at <**Insert psig**> pressure drop.

Filtration Efficiency: [**98**] <**Insert number**> percent removal of suspended particles [**10**] [**20**] [**40**] <**Insert size**> micrometers and larger from feedwater of listed filtrate design concentrations.

Backwash Flow: <**Insert gpm**> at <**Insert psig**> pressure drop.

Retain one of first two subparagraphs below.

Media Tank: Single with controls.

Media Tanks: [**Two**] [**Three**] with manifolded inlet, outlet, and drain piping and controls.

Each Media Tank:

Material: [**Carbon steel with NSF 61 Annex lining material**] [**FRP**] <**Insert material**>.

Pressure Rating: <**Insert psig**> minimum.

Distribution System: Factory-installed plastic.

Temperature Rating: <**Insert deg F**> minimum.

Diameter: <**Insert inches**>.

Height: <**Insert inches**>.

Service Valve Size: <**Insert NPS**>.

Inlet and Outlet Size: <**Insert NPS**>.

Drain Size: <**Insert NPS**>.

Filter Media: [**Graded silica sand**] <**Insert media**>.

* + - 1. SEPARATORS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2375) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[LAKOS Filtration Solutions](http://www.specagent.com/Lookup?uid=123457132818).

[PEP Filters, Inc](http://www.specagent.com/Lookup?uid=123457132815).

[Puroflux Corporation](http://www.specagent.com/Lookup?uid=123457132816).

Or equal.

Retain one of first two paragraphs below.

* + - * 1. Description: Simplex separator housing with baffles and chambers for removing sediment particles from water by centrifugal action and gravity.
				2. Description: Factory-fabricated and -tested, simplex separator system of housing with baffles and chambers, strainer, circulating pump, piping, and controls for removing sediment particles from water by centrifugal action and gravity.

Retain first paragraph below with either "Description" paragraph above.

* + - * 1. Housing: With manufacturer's proprietary system of baffles and chambers.

Construction:

Retain first subparagraph below to require steel or stainless-steel tanks to be ASME labeled; delete for non-code construction.

Fabricate and label steel separator housing to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

Retain first subparagraph below for projects in seismic areas.

Fabricate supports and base and attachment to separator housing with reinforcement strong enough to resist separator movement during a seismic event when separator base is anchored to building structure.

Inlet: Designed with tangential entry to produce centrifugal flow of feedwater.

Vortex Chamber: Designed for downward vortex flow and gravity separation of particles.

Collection Chamber: Designed to hold separated particles.

Outlet: Near top of unit.

Purge: At bottom of collection chamber.

Pipe Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “Pipe Threads, General Purpose, Inch”.

Pipe Connections NPS 2-1/2 and Larger: ASME B16.1 “Gray Iron Pipe Flanges and Flanges Fittings Classes 25, 125 and 250”; steel, Class 150 flanges according to ASME B16.5 “B16.5: Pipe Flanges & Flanged Fittings” or grooved according to AWWA C606 “Standard for Grooved and Shouldered Joints”. Provide stainless-steel flanges if tank is stainless steel.

Retain first paragraph below only if separator is circulating type.

* + - * 1. Strainer: Basket type.

Pipe Connections NPS 2 and Smaller: Threaded according to ASME B1.20.1 “ Pipe Threads, General Purpose, Inch”.

Pipe Connections NPS 2-1/2 and Larger: Cast-iron, Class 125 flanges according to ASME B16.1 “Gray Iron Pipe Flanges and Flanges Fittings Classes 25, 125 and 250”.

Retain one of first two subparagraphs below.

* + - * 1. Piping: [**Galvanized steel pipe, galvanized cast-iron fittings**] [**Stainless-steel pipe, stainless-steel fittings**], and flanged, grooved, or threaded joints.
				2. Piping: ASTM B88 “Standard Specification for Seamless Copper Water Tube”, Type L copper water tube, copper-alloy solder-joint fittings, and brazed, flanged, or grooved joints.
				3. Safety Valves: Automatic and manual pressure relief.
				4. Circulating Pump: Overhung impeller, close coupled, single stage, end suction, centrifugal. Comply with UL 778 “Standard for Safety Motor-Operated Water Pumps” and with HI 1.1-1.2 and HI 1.3.

Pump Construction: Bronze fitted.

Casing: Radially split, cast iron.

Pressure Rating: [**125 psig**] [**150 psig**] minimum.

Impeller: ASTM B584 “Standard Specification for Copper Alloy Sand Castings for General Applications”, cast bronze; statically and dynamically balanced, closed, and keyed to shaft.

Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.

Seal: Mechanical.

Motor characteristics such as NEMA designation, temperature rating, service factor, enclosure type, and efficiency are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment." If different characteristics are required, insert subparagraphs below to suit Project.

Motor: General requirements for motors are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

* + - * 1. Controls: Automatic for control of circulating pump and separator purge; factory wired for single, external electrical connection.

Panel: NEMA 250 “Enclosures for Electrical Equipment”, Type [**4**] <**Insert type**> enclosure.

Pump: Automatic and manual.

Separator Purge: Automatic and manual.

* + - * 1. Support: Skid mounting.

If more than one separator is required on Project, delete paragraph below and schedule separators on Drawings.

* + - * 1. Capacity and Characteristics:

Filtrate Design Concentrations:

Sand: <**Insert ppm**>.

Silt: <**Insert ppm**>.

<**Insert characteristic**>: <**Insert value**>.

Separator Design:

Continuous Flow: <**Insert gpm**> at [**5-psig**] <**Insert value**> pressure drop.

Peak Flow: <**Insert gpm**>.

Separator Efficiency: [**98**] <**Insert number**> percent removal of listed [**1.8**] <**Insert number**> minimum specific-gravity suspended particles [**5**] [**10**] [**20**] [**45**] <**Insert size**> micrometers and larger from feedwater of listed filtrate design concentrations.

Housing:

Material: [**Carbon**] [**Stainless**] steel.

Pressure Rating: <**Insert psig**>.

Diameter: <**Insert inches**>.

Height: <**Insert inches**>.

Inlet and Outlet Size: <**Insert NPS**>.

Purge Size: <**Insert NPS**>.

Retain first subparagraph below only if separator is circulating type.

Circulating Pump:

Capacity: <**Insert gpm**>.

Total Dynamic Head: <**Insert feet**>.

Speed: <**Insert rpm**>.

Inlet Size: <**Insert NPS**>.

Outlet Size: <**Insert NPS**>.

Pump Motor Size and Electrical Characteristics:

Horsepower: <**Insert value**>.

Volts: [**120**] [**208**] [**240**] [**277**] [**480**] <**Insert value**>.

Phase: [**Single**] [**Three**].

Hertz: [**60**] <**Insert value**>.

Unit Electrical Characteristics:

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**>.

* + - 1. SOURCE QUALITY CONTROL

Retain this article for carbon and sand filters and for separators.

* + - * 1. Before shipping, hydrostatically test [**carbon filters,**] [**circulating sand filters,**] [**multimedia sand filters,**] [**greensand filters,**] [**and**] [**separators**] to minimum of one and one-half times pressure rating.
				2. Prepare test reports.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of [**filters**] [**and**] [**separators**].
				2. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.
				3. Examine walls and floors for suitable conditions where [**filters**] [**and**] [**separators**] will be installed.
				4. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. EQUIPMENT MOUNTING

Retain paragraph below for equipment supported on slabs-on-grade.

* + - * 1. Equipment Mounting: Install [**filters, except wall-mounted cartridge filters,**] [**and**] [**separators**] on concrete bases. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."

Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of concrete base.

For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Install anchor bolts to elevations required for proper attachment to supported equipment.

* + - 1. BAG-TYPE FILTER INSTALLATION

Retain first paragraph below for cast-in-place concrete equipment base.

* + - * 1. Equipment Mounting: Install filters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
				2. Install bag-type filters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
				3. Install filter media bags.

Retain paragraph below for Project in a seismic area. Insert special requirements for seismic restraints here or detail on Drawings.

* + - * 1. Install seismic restraints for bag-type filter housings and anchor to building structure.
			1. CARTRIDGE-FILTER INSTALLATION
				1. Install cartridge filters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

Retain first paragraph below for cast-in-place concrete equipment base.

* + - * 1. Equipment Mounting: Install freestanding cartridge filters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

Exception: Omit concrete bases if installation directly on floor is indicated.

* + - * 1. Attach wall brackets for off-floor, wall-mounted, cartridge filter to vertical surface. Attach housing(s), and base if any, to wall bracket.
				2. Install housings for off-floor, in-line, cartridge filters in piping.
				3. Install filter elements in cartridges.

Retain paragraph below for Project in a seismic area. Insert special requirements for seismic restraints here or detail on Drawings.

* + - * 1. Install seismic restraints for freestanding cartridge-filter housings and anchor to building structure.
			1. CARBON-FILTER INSTALLATION
				1. Install carbon filters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
				2. Prepare carbon-filter tank distribution system and underbed, if any, for filter media and place specified media into tanks.

Retain paragraph below for Project in a seismic area. Insert special requirements for seismic restraints here or detail on Drawings.

* + - * 1. Install seismic restraints for carbon-filter housings and anchor to building structure.
			1. SAND-FILTER INSTALLATION
				1. Install sand-filter tanks on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
				2. Prepare sand-filter tank distribution system and underbed for filter media and place specified sand and other media into tanks.

Retain paragraph below for Project in a seismic area. Insert special requirements for seismic restraints here or detail on Drawings.

* + - * 1. Install seismic restraints for sand-filter tanks and accessories and anchor to building structure.
			1. SEPARATOR INSTALLATION
				1. Install separators on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

Retain paragraph below for Project in a seismic area. Insert special requirements for seismic restraints here or detail on Drawings.

* + - * 1. Install seismic restraints for separators and accessories and anchor to building structure.
			1. CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
				2. Install piping adjacent to equipment to allow service and maintenance.
				3. Make piping connections between water filtration equipment and dissimilar-metal water piping with dielectric fittings. Comply with requirements for dielectric fittings specified in Section 221116 "Domestic Water Piping."
				4. Install shutoff valves on feedwater-inlet and filtrate-outlet piping of each water filtration equipment [**filter**] [**and**] [**separator**] [**and on inlet and outlet headers**].

Comply with requirements for metal general-duty valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

Comply with requirements for plastic valves specified in Section 221116 "Domestic Water Piping."

Retain subparagraph below if factory-installed valves are acceptable.

Exception: Water filtration equipment with factory-installed shutoff valves at locations indicated.

* + - * 1. Install pressure gages on feedwater-inlet and filtrate-outlet piping of each water filtration equipment [**filter**] [**and**] [**separator**]. Comply with requirements for pressure gages specified in Section 220519 "Meters and Gages for Plumbing Piping."

Retain first subparagraph below if factory-installed valves are acceptable.

Exception: Water filtration equipment with factory-installed pressure gages at locations indicated.

Retain subparagraph below if pressure gages are not required.

Exception: Cartridge water filters.

* + - * 1. Install valved bypass water piping around each water filtration equipment [**filter**] [**and**] [**separator**].

Comply with requirements for metal general-duty valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

Comply with requirements for plastic valves specified in Section 221116 "Domestic Water Piping."

Comply with requirements for water piping specified in Section 221116 "Domestic Water Piping."

Retain one or both subparagraphs below if bypass is not required.

Exception: Bag-type water filtration equipment.

Exception: Cartridge water filtration equipment.

* + - * 1. Install drains as indirect wastes to spill into open drains or over floor drains.
			1. IDENTIFICATION
				1. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."
			2. FIELD QUALITY CONTROL

Retain first paragraph below to require a Factory-Authorized Service Representative to perform inspections, tests, and adjustments.

* + - * 1. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

Retain first paragraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform tests and inspections.

Retain subparagraph below to require a factory-authorized service representative to assist Contractor with inspections, tests, and adjustments.

Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

Retain first paragraph below to describe tests and inspections to be performed.

* + - * 1. Tests and Inspections:

Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

Retain first subparagraph below only for units with pump, controls, or electrical devices.

Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.

Retain subparagraph below only for units with controls or other devices.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

* + - * 1. Domestic water filtration equipment will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. STARTUP SERVICE
				1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to perform**] [**Perform**] startup service for [**circulating sand filters,**] [**multimedia sand filters,**] [**greensand filters,**] [**and**] [**separators**].

Complete installation and startup checks according to manufacturer's written instructions.

<**Insert startup steps if any**>.

* + - * 1. Sample [**filter**] [**and**] [**separator**] filtrate after startup and at three consecutive seven-day intervals (total of four samples) and prepare certified test reports for required water performance characteristics.
			1. DEMONSTRATION
				1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to train**] [**Train**] Director’s Representative's Facility’s maintenance personnel to adjust, operate, and maintain [**circulating sand filters,**] [**multimedia sand filters,**] [**greensand filters,**] [**and**] [**separators**].

END OF SECTION 223200