SECTION 226719 - PROCESSED WATER EQUIPMENT FOR LABORATORY AND HEALTHCARE FACILITIES

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.

This Section may include provisions for LEED 2009, LEED v4, ASHRAE 189.1, IgCC, and Green Globes. Note that some sustainable design requirements are either mandatory or optional requirements that may be inserted in the Section Text using the hypertext links. Other requirements that are associated with sustainable design, and may be considered "best practice" or retained even if a sustainable design standard is not a Project requirement, are discussed in these Evaluations.

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 [**reagent-water**] [**deionized-water**] [**distilled-water**] [**and**] [**reverse-osmosis-water**] equipment and processed water faucets. Equipment and associated control and accessories shall be capable of producing [**Type 1**] [**Type 2**] [**Type 3**] reagent grade water.

Multimedia filter.

Carbon filter.

Water softeners.

Dechlorination filter.

Deionized (DI) mixed beds.

RO systems.

Recirculating pump.

Purified-water storage tank

Point-of-use portable polishers.

Ultra-violet sterilization unit.

Recirculating pure-water faucet.

* + - * 1. Related Requirements:

Section 226713 "Processed Water Piping for Laboratory and Healthcare Facilities" for piping, fittings, and valves.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

* + - * 1. RO: Reverse osmosis.
      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, including the following.

Pump curves.

Equipment dimensions and weight data.

Electrical wiring data.

Control panel layout.

Vibration data.

* + - * 1. Sustainable Design Submittals:
        2. Shop Drawings:

Provide a flow schematic of the proposed system, showing:

Equipment and accessories.

Piping and directional flows and sizes.

Flow rates.

Connection to domestic water.

Components.

Interconnection piping.

Retain "Seismic Qualification Data" 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 Data: For equipment, accessories, and components, from manufacturer.

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

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

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.

Revise "Operation and Maintenance Data" paragraph below in accordance with requirements that pertain to this project.

* + - * 1. Operation and Maintenance Data: For all equipment in this section.
      1. QUALITY ASSURANCE
         1. Installer Qualifications: Manufacturer shall have the qualifications for supplying and servicing process water equipment, including engineering services.
         2. The process water quality shall be in accordance with ASTM D1193 “Standard Specification for Reagent Water”.

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. SOURCE LIMITATIONS
         1. Obtain processed water equipment from single source.
      2. PERFORMANCE REQUIREMENTS
         1. Design equipment based on the city of <**Insert city**> make-up water conditions obtained from the city water supply quality report.

Retain one or more of "Reagent-Water Piping," "Deionized-Water Piping," "Distilled-Water Piping," and "RO Water Piping" subparagraphs below for specific purified-water piping systems.

Reagent-Water Piping: **[20 psig] [40 psig] [50 psig] [100 psig] <Insert pressure**> unless otherwise indicated.

Deionized-Water Piping: **[50 psig] [100 psig] [150 psig] <Insert pressure**> unless otherwise indicated.

Distilled-Water Piping: **[50 psig] [100 psig] [150 psig] <Insert pressure**> unless otherwise indicated.

RO Water Piping: [**50 psig**] [**100 psig**] [**150 psig**] <**Insert pressure**> unless otherwise indicated.

Retain "Seismic Performance" paragraph below with "Seismic Qualification Data" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with structural engineer.

* + - * 1. Seismic Performance: Water piping shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

Retain first 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 "the equipment will remain in place without separation of any parts when subjected to the seismic forces specified[**and the equipment will be fully operational after the seismic event**]."

For life-safety components required to function after an earthquake (such as fire-sprinkler systems, components that contain hazardous content, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

Component Importance Factor: [**1.5**] [**1.0**].

See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table, for requirements to be inserted in subparagraph below.

**<Insert requirements for Component Amplification Factor and Component Response Modification Factor>.**

Multimedia filtration is used when it is required to process high-quality filter water at faster flow rates than traditional sand filtration can handle. For example, a simple sand filter can eliminate particles down to 25 to 50 microns in size. A multimedia filter can remove particles down to 10 to 15 microns.

* + - 1. MULTIMEDIA FILTRATION

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9096) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Aqua Pure Water Conditioning](http://www.specagent.com/Lookup?uid=123457127135).

[Diamond Water Conditioning; a Griesbach company](http://www.specagent.com/Lookup?uid=123457127104).

[Everfilt](http://www.specagent.com/Lookup?uid=123457127105).

[LAKOS Filtration Solutions](http://www.specagent.com/Lookup?uid=123457127106).

[MWF Metro Water Filter](http://www.specagent.com/Lookup?uid=123457127133).

[Miami Filter, Inc](http://www.specagent.com/Lookup?uid=123457127107).

[PEP Filters, Inc](http://www.specagent.com/Lookup?uid=123457127108).

[Puroflux Corporation](http://www.specagent.com/Lookup?uid=123457127109).

[Sonitec-Vortisand Inc](http://www.specagent.com/Lookup?uid=123457127111).

[United Industries, Inc; Tower-flo Water Systems](http://www.specagent.com/Lookup?uid=123457127110).

[Water Professionals](http://www.specagent.com/Lookup?uid=123457127134).

Or equal.

* + - * 1. Filter Tank:

Material: Fiberglass with a polyethylene liner and inner shell constructed of HDPE.

Rated Working Pressure: [**125 psig**] [**150 psig**] psig at 120 deg F temperature.

* + - * 1. Distributor Assembly:

Hub and Lateral Distribution System:

For tanks 21 inches in diameter and larger.

Material: ABS or PVC.

Single Nonclogging Segmented Distributor:

For tanks 18 inches in diameter and smaller.

Material: ABS.

* + - * 1. Operating Valves:

Fully Automatic Multiport Control Valve:

Motor-driven single-piston valve with a piston timer to control regeneration program.

Fully adjustable.

Diaphragm Valves: Permit separate water source for backwashing.

* + - * 1. Regeneration Initiation Control:

Retain one of two subparagraphs below.

Provide a seven-day time clock to allow the system to regenerate at any time of the day or night and on any day of the week.

Provide a differential pressure switch to initiate backwash based on measurement of increased pressure loss across the system.

* + - * 1. Filter Media:

Top Layer: 1.0- to 1.2-mm anthracite.

Second Layer: 0.4- to 0.5-mm flint sand.

Third Layer: 0.35- to 0.45-mm garnet.

All Layers: Resting on coarse gravel underbedding.

Retain "Carbon Filter" Article below to remove organic compounds responsible for taste, odor, chlorine, and the removal of low-molecular-weight materials.

* + - 1. CARBON FILTER

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13503) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[ADCOA](http://www.specagent.com/Lookup?uid=123457127136).

[EVOQUA Water Technologies](http://www.specagent.com/Lookup?uid=123457127138).

[Gremarco Industries, Inc](http://www.specagent.com/Lookup?uid=123457127140).

[Omnipure Filter Company](http://www.specagent.com/Lookup?uid=123457127137).

[United Filters International](http://www.specagent.com/Lookup?uid=123457127139).

Or equal.

* + - * 1. Filter Tank:

Welded, industrial-grade, cold-rolled carbon steel with dished heads constructed and stamped in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Rules for Construction of Pressure Vessels. Tank shall have the maximum working pressure of not less the **[125 psig] [150 psig**].

Filter Media:

Two layers of graduated supporting gravel.

One layer of **[2 cu. ft.] <Insert number**> of activated carbon.

Bottom layer of coarse gravel underbedding.

The tank shall be provided with O-Ring seals at the openings, inlets, and outlets.

Tank shall have an epoxy enamel finish.

Provide seven-day time clock to allow the system to regenerate at any time of the day or night and on any day of the week.

Retain "Water Softeners" Article below to reduce the calcium and magnesium present. Also consider water softeners for water iron content higher than 0.4 ppm.

* + - 1. WATER SOFTENERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9094) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[3M](http://www.specagent.com/Lookup?uid=123457127078).

[CSI Water Treatment Systems](http://www.specagent.com/Lookup?uid=123457127079).

[Culligan International Company](http://www.specagent.com/Lookup?uid=123457127080).

[Diamond Water Conditioning; a Griesbach company](http://www.specagent.com/Lookup?uid=123457127081).

[EVOQUA Water Technologies](http://www.specagent.com/Lookup?uid=123457127113).

[Ecodyne Limited](http://www.specagent.com/Lookup?uid=123457127090).

[Hungerford & Terry, Inc](http://www.specagent.com/Lookup?uid=123457127083).

[Hydro Service and Supplies](http://www.specagent.com/Lookup?uid=123457127114).

[Kinetico Incorporated](http://www.specagent.com/Lookup?uid=123457127084).

[Marlo Incorporated](http://www.specagent.com/Lookup?uid=123457127085).

[Parker Boiler](http://www.specagent.com/Lookup?uid=123457127086).

[Pentair, Inc](http://www.specagent.com/Lookup?uid=123457127087).

Or equal.

* + - * 1. Standards: Comply with NSF 44.
        2. Softener Tank: [**Welded, industrial-grade, cold-rolled carbon steel**] [**Fiberglass-reinforced polyester (FRP)**].

**[120-psig] [150-psig]** operating pressure and ASME stamped.

Design at a temperature of 120 deg?F.

Tank to be lined with 20-mil-thick vinyl bag.

Mineral Bed: Non-phenolic polystyrene resin with a minimum exchange capacity of **[30,000] <Insert number**> grains per cubic foot when regenerated with [**7 lbs] [15 lbs**] of salt per cubic foot (m[3]). Mineral shall be solid and particle the proper size, not more than 4 percent through a No. 40 mesh wet screening and shall not contain any foreign shapes that will interfere with the normal operation of the softener.

* + - * 1. Brine Tank: Shall be molded rigid polyethylene with cover, sized to hold <**Insert lb**> of salt per cubic foot. Tanks shall be furnished with a metering system, valves, and controls.

Dechlorination filter removes chlorine from the incoming water system.

* + - 1. DECHLORINATION FILTER

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13505) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Culligan International Company](http://www.specagent.com/Lookup?uid=123457127119).

[EVOQUA Water Technologies](http://www.specagent.com/Lookup?uid=123457127116).

[Hydro Service and Supplies](http://www.specagent.com/Lookup?uid=123457127117).

[Marlo Incorporated](http://www.specagent.com/Lookup?uid=123457127118).

[WATTS; A Watts Water Technologies Company](http://www.specagent.com/Lookup?uid=123457127115).

Or equal.

* + - * 1. Filter: Two independent, activated carbon filters in parallel. Resultant residual chlorine concentration shall be less than 0.1 ppm.
        2. Filter Vessel: Fiberglass-reinforced molded-thermoplastic inner shell with dished heads, equipped with reinforced openings for piping connections.

Hand hole at the top and bottom.

Vessel to be rated at 150-psig working pressure in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Rules for Construction of Pressure Vessels.

* + - * 1. Provide controls compatible with the facility control system. Provide connection for trouble alarm.
        2. Provide pressure gauges with simple cocks on inlet and outlet of each tank.
      1. DEIONIZED (DI) MIXED BEDS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13506) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Culligan International Company](http://www.specagent.com/Lookup?uid=123457127124).

[EVOQUA Water Technologies](http://www.specagent.com/Lookup?uid=123457127121).

[Hydro Service and Supplies](http://www.specagent.com/Lookup?uid=123457127122).

[Marlo Incorporated](http://www.specagent.com/Lookup?uid=123457127123).

[WATTS; A Watts Water Technologies Company](http://www.specagent.com/Lookup?uid=123457127120).

Or equal.

* + - * 1. Tank:

Material: Reinforced fiberglass with vinyl ester lining for removing dissolved ionized solids.

Minimum Water Resistivity: 10 megohm - cm at 25 deg C.

Pressure Ratings: Operating pressure of not less than [**125 psig**] [**150 psig**] and test pressure not less than 185 psig.

* + - * 1. Resin: Suitable for using in mixed-bed deionizer application and for intended application.
      1. REVERSE OSMOSIS (RO) SYSTEMS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9095) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[3M](http://www.specagent.com/Lookup?uid=123457127103).

[CSI Water Treatment Systems](http://www.specagent.com/Lookup?uid=123457127091).

[Culligan International Company](http://www.specagent.com/Lookup?uid=123457127092).

[Diamond Water Conditioning; a Griesbach company](http://www.specagent.com/Lookup?uid=123457127094).

[EVOQUA Water Technologies](http://www.specagent.com/Lookup?uid=123457127126).

[Ecodyne Limited](http://www.specagent.com/Lookup?uid=123457127102).

[Hydro Service and Supplies](http://www.specagent.com/Lookup?uid=123457127127).

[Marlo Incorporated](http://www.specagent.com/Lookup?uid=123457127128).

[Pentair, Inc](http://www.specagent.com/Lookup?uid=123457127098).

[WATTS; A Watts Water Technologies Company](http://www.specagent.com/Lookup?uid=123457127125).

[Water & Power Technologies Incorporated](http://www.specagent.com/Lookup?uid=123457127100).

[Water King](http://www.specagent.com/Lookup?uid=123457127101).

Or equal.

* + - * 1. Pressurized Membrane System: High-pressure pump forces water through the membrane(s) to remove 99 percent of organic solids, bacteria, contaminants, and particles and 97 percent of dissolved solids.
        2. Pre-filtration: Polypropylene depth filters, capable of removing 90 percent of particles greater than 5 micron.

Housing:

**[Type 304] [Type 316**] stainless steel.

Include vent and drain plugs with EPDM o-rings.

Include [**Type 304**] [**Type 316**] pressure gauge at the inlet and outlet.

* + - * 1. Membrane modules with thin-film composite type membranes and membrane vessels to allow a maximum flux for the following:

First State: **[18 gallons per square foot per day] <Insert capacity**> of membrane surface area at **[17] <Insert number**> percent recovery.

Second Stage: [**30 gallons per square foot**] <**Insert number**> per day of membrane surface area at [**35**] <**Insert number**> percent recovery.

* + - * 1. Panel-Mounted Controls and Instrumentation on a Common Frame:

Material**: [Stainless steel] [Epoxy-coated aluminum**].

Features:

Flow meters

**[Type 304] [Type 316**] stainless steel pressure gauges for pump discharge and regulated pump pressure.

Control valves.

Pump starter with indicated light.

Feedwater pressure switch with time delay for low-pressure shutdown.

Time controller for automatic fast flush.

Monitor/controller with selector switch for feed to monitor conductivity.

Trouble alarm with ability to connect to the building management system.

* + - 1. PURIFED-WATER STORAGE TANK
         1. Material: Fabricated of molded polyethylene with a cone bottom and extra heavy wall construction. Provide with **[two] [four**] lifting lugs of [**Type 304] [Type 316**] stainless steel.
         2. Mounting: Steel stand assembly with hold-down lugs of [**Type 304**] [**Type 316**] stainless steel.
      2. RECIRCULATING PUMP

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13509) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Goulds Water Technology; a Xylem brand](http://www.specagent.com/Lookup?uid=123457216552).

Or equal.

* + - * 1. Type: **[Vertical] [Horizontal**].
        2. Pump Material: [**Type 304] [Type 316]** stainless steel.
        3. Impeller Material: Stainless steel.
        4. Seals: Mechanical.
        5. Gaskets: Teflon.
        6. Size and capacity as shown on Drawings.

Point-of-use portable polishers come in different sizes and are able to produce Type I, Type II, Type III, RO, and DI water.

* + - 1. POINT-OF-USE PORTABLE POLISHERS
         1. The system shall be capable of operating from **[ordinary tap] [pretreated**] water.
         2. The unit shall produce purified water that complies with ASTM International, College of American Pathologists, and Clinical Laboratory Standards Institute specifications and USP29-NF24 for [**Type I] [Type II] [Type III**] grade water.
         3. Output Flow Rate: [**0.44 gpm] <Insert value**>.
         4. Accessories: Inlet shut-off valve.
      2. ULTRA-VIOLET STERILIZATION UNIT
         1. Inline Sterilizer Light: Provide to reduce the bacteria.
         2. Ultra-Violet Lamps: <**Insert number**> ultra-violet lamp(s), designed to operate at 115 V, single phase, 60 Hz.

Housing: Type 304, electro-polished and passavated stainless steel, complying with MIL-S-5002.

* + - * 1. Provide a sensor that will be able to indicate level of UV radiation being produced.

Depending on user preference, retain "Recirculating Pure-Water Faucet" or "Non-recirculating Pure-Water Faucet" Article below. Consider using a recirculating faucet if a two-pipe recirculating system is used.

* + - 1. RECIRCULATING PURE-WATER FAUCET
         1. Faucet:

Deck-mounted recirculating type to eliminate dead legs in the purified-water system.

Plastic lined.

Include diaphragm valve with a brass valve stem and bonnet; on-off control.

Compatible with grade of water delivered.

* + - 1. NON-RECIRCULATING PURE-WATER FAUCET
         1. Faucet:

Deck-mounted non-recirculating type.

Brass casting and inert polypropylene-lined interior.

Include diaphragm valve with a brass valve stem and bonnet; on-off control.

* + - 1. SOURCE QUALITY CONTROL
         1. Manufacturer to perform a factory test of components, piping, and skid assemblies prior to shipment and furnish certification that the testing has been performed and the certification meets specified design requirements.

1. EXECUTION
   * + 1. INSTALLATION
          1. General Locations and Arrangements: Drawings and details indicate general location and arrangement of water piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

Retain first paragraph below if equipment is required to withstand seismic design loads.

* + - * 1. Install seismic restraints on equipment. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
        2. Install equipment in accordance with all codes, standards, and manufacturers recommendations.
        3. Provide documentation that the equipment has been installed in accordance with manufacturers requirements.
        4. Provide a startup of the equipment and a per-check of all associated piping, valves, control devices and control panels.
        5. After completion of the installation, provide up to eight hours of instructional time with the Director’s Representative's personnel.
        6. Mount equipment and/or skid(s) on concrete pads.
        7. Connect, calibrate, balance, and adjust equipment, devices, and instrumentation to perform functions as specified.
      1. PIPING CONNECTIONS

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

* + - * 1. Drawings indicate general arrangement of equipment, piping, fittings, and specialties.
        2. Where installing equipment, allow space for service and maintenance.
        3. Connect [**deionized-water**] [**distilled-water**] [**and**] [**RO water**] piping to equipment and service outlets with unions or flanges.
      1. IDENTIFICATION
         1. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."
      2. FIELD QUALITY CONTROL

Retain one of first four paragraphs below. Retain "Testing Agency" paragraph below if Owner will hire an independent testing agency.

* + - * 1. Testing Agency: Director’s Representative will engage a qualified testing agency to perform tests and inspections.

Retain "Testing Agency" paragraph below to require Contractor to hire an independent testing agency.

* + - * 1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Retain "Manufacturer's Field Service" paragraph below to require a factory-authorized service representative to perform tests and inspections.

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

Retain "Perform tests and inspections" paragraph below to require the Contractor to perform tests and inspection, and retain optional text to require Contractor to arrange for the assistance of a factory-authorized service agent.

* + - * 1. Perform tests and inspections**[ with the assistance of a Company Field Advisor per OGS Spec Section 014216].**

Retain test requirements in "Tests and Inspections" paragraph below with any combination of paragraphs above.

* + - * 1. Tests and Inspections:

After installation, Installer shall test equipment for performance, leaks, and defects.

The Installer shall notify the **[authorities having jurisdiction] [Director’s Representative] [Architect] [and] [engineer]**, with at least 24 hours' advance notice.

Do not cover equipment or put into service before inspection and approval by the **[authorities having jurisdiction] [Director’s Representative] [Architect] [and] [engineer] <Insert approval authority>.**

Submit separate reports for each test.

* + - * 1. Processed-water system will be considered defective if it does not pass tests and inspections.
        2. Prepare test and inspection reports.
      1. SANITIZING OF EQUIPMENT SERVING HEALTHCARE
         1. Use procedures prescribed by [**authorities having jurisdiction**] [**Director’s Representative**] or, if not prescribed, use procedures described below:

Cleaning of system as indicated or in accordance with AWWA-C601.

Remove flow indicators and flow measuring devices before flushing. Replace after cleaning is completed.

Sanitize equipment by flushing at a sufficient velocity and quantity to dislodge sediment or dirt with [**reagent**] [**deionized**] [**distilled**] [**and**] [**reverse-osmosis**] water mixture throughout the system.

Opening and closing valves several times collecting samples from various fixtures throughout the system during introduction of chlorine to assure uniform distribution.

After flushing provide evidence of effectiveness of disinfection by filing a report with the [**Director’s Representative**] [**authorities having jurisdiction**], laboratory reports of bacteriological tests on samples taken from the system. The report shall include the number and locations of where the samples were taken.

If satisfaction is not achieved, repeat the above disinfection process until satisfactory results are obtained. And do not put the system online until this has been obtained.

* + - 1. SANITIZING OF EQUIPMENT SERVING LABORATORIES
         1. Use procedures prescribed by [**authorities having jurisdiction**] [**Director’s Representative**] or, if not prescribed, use procedures described below:

Remove flow indicators and flow-measuring devices before flushing. Replace after cleaning is completed.

Clean equipment by pumping at a sufficient velocity and quantity to dislodge sediment or dirt with sodium hypochlorite and a [**deionized-**] [**distilled-**] [**and**] [**RO-**] water mixture throughout the system.

Open all taps until solution is detected, then close taps. Retain solution in the system at least [**three**] [**four**] <**Insert number**> hours.

END OF SECTION 226719