SECTION 211339 - FOAM-WATER SYSTEMS

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

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY

This Section is intended to be used with Section 210523 "General-Duty Valves for Fire Protection Piping," Section 211313 "Wet-Pipe Sprinkler Systems," and/or Section 211316 "Dry-Pipe Sprinkler Systems," which specify sprinkler piping, valves, and valve specialties that make up a complete foam-water system.

* + - * 1. Section Includes:

Concentrate piping and piping specialties.

Bladder tanks and proportioning devices.

Foam concentrate.

Discharge devices.

Monitoring and alarm devices.

* + - 1. DEFINITIONS

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

* + - * 1. AFFF: Aqueous film-forming foam.
				2. AR-AFFF: Alcohol-resistant aqueous film-forming foam.
				3. Discharge Devices: Include, but are not limited to, sprinklers, spray nozzles, and hose nozzles.
			1. SYSTEM DESCRIPTION

Describe design criteria of foam-water system in this article. "Description" Paragraph below is a sample description of a basic system. Revise to suit Project.

* + - * 1. Description: Engineered, fixed, [**wet-pipe**] [**dry-pipe**] [**preaction**] [**deluge**], automatically actuated, low-expansion, [**AR-**]AFFF fire-extinguishing system for flammable-liquid fires. System includes diaphragm proportioning tanks and devices as described in NFPA 16 “Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems”.
			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. Fire Protection Engineer Qualification:

Where required by this specification or the project drawings to provide the services of a professional Director’s Representative, the professional Director’s Representative shall be a licensed Fire Protection Engineer, who is actively licensed in the State of New York.

A licensed Fire Protection Engineer shall be defined as a register professional Director’s Representative (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES) or who has obtained a B.S. or M.S. Degree in “Fire Protection Engineering” from an accredited engineering program at a recognized University or Institute.

* + - * 1. Product Data: For each type of product. Include the following:

Retain first subparagraph below if required by authorities having jurisdiction.

Piping, valves, fittings, and hangers.

Seismic restraints for all equipment.

Bladder tanks and proportioning devices.

Foam concentrate.

Discharge devices. Include flow characteristics.

Monitoring and alarm devices. Include electrical data and supervision method.

Foam-concentrate pumps. Include power supply and controller.

Foam-concentrate storage tanks.

Strainers.

Test connections.

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

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for steel pipe within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

* + - * 1. Shop Drawings: For foam-water systems. Prepare in accordance with requirements of NFPA 16 “Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems”, to include, but not be limited to, the following:

Include plans, elevations, sections, and attachment details.

Include design calculations.

Include details of equipment assemblies. Indicate dimensions, weights, loads, manufacturer-required clearances, method of field assembly, components, and location and size of each field connection.

Retain first subparagraph below if equipment includes wiring.

Include diagrams for power, signal, and control wiring.

Permit-Approved Documents: Working plans and hydraulic calculations approved by authorities having jurisdiction.

The shop drawings shall be developed by and the hydraulic calculations shall be performed by person(s) meeting one of the following minimum qualification levels (without substitution):

National Institute for Certification in Engineering Technologies (NICET) Level III for Water-Based Fire Protection Systems certified technicians, OR

National Institute for Certification in Engineering Technologies (NICET) Level IV for Water-Based Fire Protection Systems certified technicians, OR

A licensed Professional Fire Protection Engineer, licensed in the State of New York, and as defined by this specification.

Where a NICET Level III or IV Technician in “Water-Based Fire Protection System Layout” performs the shop drawings and hydraulic calculations, the drawings and hydraulic calculations shall bear the seal and signature of the NICET Technician.

Where a licensed Professional Fire Protection Engineer performs the shop drawings and hydraulic calculations, the drawings and hydraulic calculations shall bear the seal and signature of the licensed Professional Fire Protection Engineer.

Retain "Delegated Design Submittals" Paragraph below if design services have been delegated to Contractor.

* + - * 1. Design Submittal: For foam-water systems indicated to comply with performance and design criteria, including analysis data.
				2. Seismic Submittals: Provide sway bracing Seismic Shop drawings per NFPA 13 Section 9.3 and the requirements of the Contract Documents.

Include plans, elevations, section, and location of attachments with details incorporating sway bracing, flexibility, clearances, and anchoring.

Seismic Bracing Calculations

Refer to Specification 210529 “Hangers and Supports for Fire Suppression Piping and Equipment” for additional information and requirements.

* + - * 1. Quality Control Submittals:

Design Data: All portions of the sprinkler system shall be sized in accordance with NFPA requirements for Hydraulically Designed Systems. Submit Drawings and hydraulic calculations for approval.

Certificates: As required under Quality Assurance Article.

Company Field Advisor Data: Include:

Name, business address and telephone number of Company Field Advisor secured for the required services.

Certified statement from the Company listing the qualifications of the Company Field Advisor.

Services and each product for which authorization is given by the Company, listed specifically for the project.

Copy of:

NICET Letter of Approval of advisor indicating Level III for Water-Based Fire Protection Systems certification or

NICET Letter of Approval of advisor indicating Level IV for Water-Based Fire Protection Systems certification OR

Licensure certificate for Professional Engineering in the State of New York, AND National Council of Examiners for Engineering and Surveying (NCEES) record/certificate for verification of completion of the Principles of Practice of Fire Protection Engineering Exam of copy of certified B.S. or M.S. degree from an accredited Fire Protection Engineering program.

Contractor’s Qualifications Data:

Contractor’s name, business address and telephone number

Names and addresses of 3 similar projects that each person has worked on during the past 5 years.

Name of Project Manager for the project that is National Institute for Certification in Engineering Technologies (NICET) certified as Level III or IV for Water-Based Fire Protection Systems, or is a registered Professional Fire Protection Engineering in the State of New York. Provide a copy of Project Manager’s:

NICET Letter of Approval indicating Level III for Water-Based Fire Protection Systems certification, OR

NICET Letter of Approval indicating Level IV for Water-Based Fire Protection Systems certification, OR

Licensure certificate for Professional Engineering in the State of New York, AND National Council of Examiners for Engineering and Surveying (NCEES) record/certificate for verification of completion of the Principles of Practice of Fire Protection Engineering Exam or copy of certified B.S. or M.S. degree from an accredited Fire Protection Engineering program.

Installer’s Qualifications Data:

Name of each person will be performing the Work and their employer’s name, business address and telephone number.

Names and addresses of 3 similar projects that each person has worked on during the past 5 years.

Working Drawing/Hydraulic Calculation Preparer Qualification Data. Working drawings and hydraulic calculations shall be prepared by either a:

National Institute for Certification in Engineering Technologies (NICET) certified as Level III for Water-Based Fire Protection Systems technician.

National Institute for Certification in Engineering Technologies (NICET) certified as Level IV for Water-Based Fire Protection Systems technician.

A licensed Professional Fire Protection Engineer, licensed in the State of New York, and as defined by this specification.

Name of each person who will be preparing working drawings/hydraulic calculations, required for the Work.

Upon request, furnish names and addresses of the required number of similar projects that each person has worked on which meet the experience criteria.

For the Working Drawing/Hydraulic Calculation Preparer qualification data, provide a copy of:

NICET Letter of Approval of supervisor indicating Level III for Water-Based Fire Protection Systems certification OR

NICET Letter of Approval of supervisor indicating Level IV for Water-Based Fire Protection Systems certification OR

Licensure certificate for Professional Engineering in the State of New York, AND National Council of Examiners for Engineering and Surveying (NCEES) record/certificate for verification of completion of the Principles of Practice of Fire Protection Engineering Exam or copy of certified B.S. or M.S. degree from an accredited Fire Protection Engineering program.

Retain "Coordination Drawings" Paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Plans, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

Retain "Seismic Qualification Data" Paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Data: Certificates for fire-extinguishing-agent containers and control panels, 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 "Welding certificates" Paragraph below if retaining "Pipe and Pressure-Vessel Welding Qualifications" Paragraph in "Quality Assurance" Article.

* + - * 1. Welding certificates.

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

* + - * 1. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For foam-water fire-extinguishing system to include in emergency, operation, and maintenance manuals.

Include the following:

Valves and specialties.

Bladder tanks and proportioning devices.

Foam concentrate.

Discharge devices. Include flow characteristics.

Monitoring and alarm devices. Include supervision method.

Foam-concentrate pumps. Include controller.

Foam-concentrate storage tanks.

Strainers.

Test connections.

* + - 1. MAINTENANCE MATERIAL SUBMITTALS
				1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Director’s Representative.

Discharge Devices: Not less than [**20**] <**Insert number**> percent of amount of each type installed.

Foam Concentrate: Not less than [**200**] <**Insert number**> percent of amount installed.

* + - 1. QUALITY ASSURANCE
				1. Company Field Advisor with qualifications identified above. Secure the services of a Company Field Advisor for the following:

Rend advice regarding installation and final adjustment of the system.

Witness final system test and then certify with an affidavit that the system is installed in accordance with the Contract Documents and is operating properly.

Train facility personnel in operation, and routine maintenance of the system.

The Company Field Advisor shall be certified per:

National Institute for Certification in Engineering Technologies (NICET) Level III for Water-Based Fire Protection Systems certified technicians, OR

National Institute for Certification in Engineering Technologies (NICET) Level IV for Water-Based Fire Protection Systems certified technicians, OR

A licensed Professional Fire Protection Engineer, licensed in the State of New York, and as defined by this specification.

* + - * 1. Contractor Qualifications: The Contractor performing the Work of this Section shall be experienced in sprinkler work and shall have been regularly engaged in the installation of sprinkler systems for a minimum of 10 years and shall, upon request, furnish to the Director’s Representative the names and addresses of 5 similar projects which the Contractor worked on during the last 5 years.

The Project Manager employed to supervise the Work shall be National Institute for Certification in Engineering Technologies (NICET) certified as Level III or IV for Water-Based Fire Protection Systems, OR shall be a professional Fire Protection Engineer (as defined by this specification) licensed in the State of New York. The services of a Project Manager shall include, but are not limited to, the following:

Attendance at meetings during construction.

Render advice regarding installation and final adjustment of the system.

Witness final system test and then certify with an affidavit that the system is installed in accordance with the Contract Documents and is operating properly.

Performance of hydraulic calculations and development of Working Drawings.

* + - * 1. Installer Qualifications: The workers and supervisors performing the Work of this Section shall be personally experienced in sprinkler systems Work and shall have been regularly employed by a company engaging in the installation of sprinkler systems for a minimum of 5 years and shall, upon request, furnish to the Director’s Representative the names and addresses of 5 similar projects which they have worked on during the last 5 years.
				2. Working Drawing/Hydraulic Calculation Preparer Qualifications:

The persons employed to prepare these documents for the Work shall be personally experienced in sprinkler work and shall have been regularly performing such work for a minimum of 5 years while in the employ of a company or companies engaged in the installation of fire protection systems.

Upon request, furnish to the Director’s Representative the names and addresses of five similar projects which the foregoing people have prepared working drawings/hydraulic calculations on during the past 3 years.

The persons employed to prepare these documents for the Work shall be performed by person(s) meeting one of the following minimum qualification levels (without substitution):

National Institute for Certification in Engineering Technologies (NICET) Level III for Water-Based Fire Protection Systems certified technicians, OR

National Institute for Certification in Engineering Technologies (NICET) Level IV for Water-Based Fire Protection Systems certified technicians, OR

A licensed Professional Fire Protection Engineer, licensed in the State of New York, and as defined by this specification.

* + - * 1. System Acceptance:

Comply with NFPA 13 requirements.

Complete and sign the Contractor’s Material and Test Certifications and provide copies to Director’s Representative.

Tests shall be witnessed by the Director’s Representative.

* + - * 1. Regulatory Requirements:

Materials for the Work of this Section shall be Underwriter’s Laboratories listed, and/or Factory Mutual approved.

* + - * 1. Certification: NFPA Contractor’s Material and Test Certificate.
				2. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.
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. PERFORMANCE REQUIREMENTS
				1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

Retain "FM Global Compliance" Paragraph below if FM-Approved components are required.

* + - * 1. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Approvals' "Approval Guide."
				2. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."
				3. Standard Working Pressure of Piping-System Component: Listed for a minimum of 175 psig.
				4. Unless authorities having jurisdiction have stricter requirements, minimum design parameters are as follows:

Solution: [**3**] <**Insert number**> percent foam-water solution.

Sprinkler Spacing: Maximum of [**100 sq. ft.**] <**Insert area**> per sprinkler, and maximum [**12-foot**] <**Insert dimension**> spacing.

Design Density: Minimum [**0.16 gpm/sq. ft.**] <**Insert value**>.

Foam Supply: Minimum [**10**] <**Insert number**>-minute discharge time.

Water Supply: Minimum [**60**] <**Insert number**> minutes.

Remote Area: Minimum [**5000-sq. ft.**] <**Insert area**> design area for closed-sprinkler systems. Open-sprinkler systems shall discharge over the entire system area.

Sprinkler Temperature Rating: Maximum 250 to 300 deg F at a roof or ceiling, and 135 to 170 deg F for intermediate sprinklers.

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: Fire-suppression piping shall withstand the effects of earthquake motions determined in accordance with [**NFPA 13**] [**and**] [**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 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**]."

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**>.

* + - 1. CONCENTRATE PIPING MATERIALS

Retain first paragraph below if requirements are specified in other Sections.

* + - * 1. Comply with requirements specified in Section 211313 "Wet-Pipe Sprinkler Systems" or Section 211316 "Dry-Pipe Sprinkler Systems" for pipes, fittings, joining materials, and valves.

Retain "Schedule 40, Black Steel Pipe"; "Stainless Steel Pipe"; or "Red Brass Pipe" Paragraph below if requirements are specified in this Section. Schedule 40, black steel piping can be used with AFFF. Some concentrate manufacturers recommend brass or stainless steel pipe with AR-AFFF.

* + - * 1. Schedule 40, Black Steel Pipe: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, [**Type E**] <**Insert type**>, [**Grade B**] <**Insert grade**> or ASTM A795 “Standard Specification for Black and Hot-Dipper Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use”, [**Type E**] <**Insert type**>. Pipe ends may be factory or field formed to match joining method.

Gray Iron Threaded Fittings, Classes 125 and 250: ASME B16.4 “Gray Iron Threaded Fittings Classes 125 and 250”.

Gray Iron Pipe Flanges and Flanged Fittings: ASME B16.1 “Gray Iron Pipe Flanges and Flanges Fittings Classes 25, 125 and 250”.

Malleable Iron Threaded Fittings, Classes 150 and 300: ASME B16.3 “Malleable Iron Threaded Fittings Classes 150 and 300”.

* + - * 1. Stainless Steel Pipe: ASTM A312 “Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes”, Schedule 40, [**Type 304**] [**or**] [**Type 316**], with factory-formed threaded or beveled ends; ASTM A376 “Standard Specification for Seamless Austenitic Steel Pipe for High-Temperature Service” for seamless pipe; or ASTM A213 “Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes”, ASTM A249 “Standard Specification for Welded Austenitic Steel Boiler, Superheater, Heat-Exchanger and Condenser Tubes”, and ASTM A269 “Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service” for seamless and welded tubing.

Class 150 Threaded Fittings: ASME B16.3 “Malleable Iron Threaded Fittings Classes 150 and 300” and MSS SP-114 “Corrosion Resistant Pipe Fittings Threaded and Socket Welding Class 150 and 1000”.

Butt-Weld Fittings: ASTM A403 “Standard Specification for Wrought Austenitic Stainless Steel Pipe Fittings”.

Flanges, Forged Fittings and Flanges, and Socket-Weld Fittings: ASTM A182 “Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service”.

Bar Stock and Compression Fittings: ASTM A276 “Standard Specification for Stainless Steel Bars and Shapes” and ASTM A479 “Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels”.

* + - * 1. Red Brass Pipe: ASTM B43 “Standard Specification for Seamless Red Brass Pipe, Standard Sizes”, Schedule 40, with factory- or field-formed threaded ends.

Threaded Fittings: ASME B16.11 “Forged Fittings, Socket-Welding and Threaded”.

* + - 1. VALVES
				1. Comply with requirements specified in Section 210523 "General-Duty Valves for Water-Based Fire Suppression Piping.

UL listed or FM Approved for use in fire-protection systems.

Compatible with type of foam concentrate used.

* + - 1. SYSTEM COMPONENTS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=1592) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Chemguard; brand of Johnson Controls International plc, Building Solutions North America](http://www.specagent.com/Lookup?uid=123457151572).

[National Foam](http://www.specagent.com/Lookup?uid=123457151570).

Approved equivalent.

* + - * 1. Source Limitations: Obtain system components from single source from single manufacturer.
				2. System components to be in accordance with NFPA 16 “Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems”, be compatible with the foam concentrate, and be designed to be drained and cleaned.

Retain one of two "Foam-Concentrate Storage Tanks" paragraphs below. Indicate tank capacity on Drawings.

* + - * 1. Foam-Concentrate Storage Tanks: Buna-N, bladder-type proportioning tank complying with UL 162 “Foam Equipment and Liquid Concentrates” and ASME Boiler and Pressure Vessel Code: Section VIII; designed for use with foam-concentrate pumps and for specific type of foam concentrate used. Include bladder, internal piping, fill and drain, glass sight gage, piping, and valves. Contain concentrate in the bladder.

Orientation: [**Horizontal design with saddle**] [**Vertical design with skirt**] support.

* + - * 1. Foam-Concentrate Storage Tanks: Atmospheric type, complying with UL 162 “Foam Equipment and Liquid Concentrates” and ASME Boiler and Pressure Vessel Code: Section VIII; designed for use with foam-concentrate pumps and for specific type of foam concentrate used. Include pressure-vacuum vent, fill and drain, glass sight gauge, piping, and valves.
				2. Foam-Concentrate Pumps: Listed for use in foam-water systems in accordance with NFPA 20 “Standard for the Installation of Stationary Pumps for Fire Protection”. Include supply-side pressure relief valve and drain cock or valve.
				3. Proportioning Controllers: Venturi type complying with UL 162 “Foam Equipment and Liquid Concentrates” and of capacity to match design at minimum and maximum flow.
				4. Concentrate Control Valves: Water-operated ball or deluge valve designed to open with flow through the proportioning controller.
				5. Concentrate Strainers: Bronze body and stainless steel mesh strainer with minimum 0.125-inch perforations to remove solids that would block system components.
				6. Pressure Gauges: Comply with UL 393 “Standard for Indicating Pressure Gages for Fire-Protection Service”; with 3-1/2-inch minimum-diameter dial, 0- to 300-psig dial range, and caption "WATER" or "CONCENTRATE" on dial face.
			1. FOAM CONCENTRATE
				1. Description: [**AR-**]AFFF liquid concentrate, complying with NFPA 11 “Standard for Low, Medium, and High-Expansion Foam” and UL 162 “Foam Equipment and Liquid Concentrates”, for making foam-water fire-extinguishing foam solution.
			2. DISCHARGE DEVICES
				1. Discharge devices shall be UL listed or FM Approved.

In "Sprinklers" Paragraph below, retain closed, non-air-aspirating sprinklers for wet-pipe, dry-pipe, and preaction systems; retain open, non-air-aspirating or air-aspirating sprinklers for deluge systems.

* + - * 1. Sprinklers: [**Closed,**] [**Open,**] [**non-**]air-aspirating type; UL listed or FM Approved and listed for use with type of foam concentrate used.
				2. Spray Nozzles: For foam water; include foam generator and distributing deflector to distribute foam or water.
			1. MONITORING DEVICES
				1. Valve Supervisory Switches: Single pole, double throw, with normally closed contacts complying with UL 753 “Standard for Alarm Accessories for Automatic Water-Supply Control Valves for Fire Protection Service”. Switch shall signal an alarm condition at fire-alarm panel or releasing panel when valve is in other than fully open position.
				2. Pressure Switches: Single pole, double throw, UL listed or FM Approved and complying with UL 753 “Standard for Alarm Accessories for Automatic Water-Supply Control Valves for Fire Protection Service”. Switch shall signal an alarm condition at fire-alarm panel or releasing panel when switch is in other than fully open position.
				3. Flow Switches: Single pole, double throw, UL listed or FM Approved and complying with UL 753 “Standard for Alarm Accessories for Automatic Water-Supply Control Valves for Fire Protection Service”. Switch shall signal an alarm condition at fire-alarm panel or releasing panel when switch is in other than fully open position.
			2. ALARM DEVICES

Delete this article for wet- and dry-pipe, closed-sprinkler systems that are specified in Section 211313 "Wet-Pipe Sprinkler Systems," Section 211316 "Dry-Pipe Sprinkler Systems," Section 284621.11 "Addressable Fire-Alarm Systems," which specifies actuation and monitoring devices for preaction and deluge system.

* + - * 1. Description: UL listed or FM Approved, low voltage, and surface mounting.
1. EXECUTION
	* + 1. CONCENTRATE STORAGE TANK INSTALLATION
				1. Equipment Mounting:

Retain first subparagraph below to require equipment to be installed on cast-in-place concrete equipment bases.

Install concentrate storage tanks on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

Retain one of two subparagraphs below. Retain first for projects in seismic areas; retain second for projects not in seismic areas. Indicate vibration isolation and seismic-control device type and minimum deflection in supported equipment schedule on Drawings.

Comply with requirements for vibration isolation and seismic-control devices specified in Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

Comply with requirements for vibration isolation devices specified in Section 210548.13 "Vibration Controls for Fire-Suppression Piping and Equipment."

* + - * 1. Install concentrate storage tanks anchored to substrate in accordance with tank manufacturer's written instructions.
				2. Install tanks level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

Retain option in paragraph below if Project is in seismically active area.

* + - * 1. [**Install seismic restraints for tanks.**]Anchor tanks to substrate.
			1. PIPING INSTALLATION
				1. Install piping and components level and plumb.
				2. Install pipe and fittings, valves, and discharge devices in accordance with requirements listed in NFPA 16, "Installation of Foam-Water Sprinkler and Foam-Water Spray Systems."

Support piping using supports and methods in accordance with NFPA 13 “Standard for the Installation of Sprinkler Systems”.

Retain first subparagraph below if Project is in seismically active area.

Install seismic restraints for concentrate storage tanks and piping systems.

Install monitoring and alarm devices in accordance with NFPA 16 “Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems” and NFPA 72 “National Fire Alarm and Signaling Code”.

Retain applicable paragraphs below for threaded, grooved, or welded joining method.

* + - * 1. Install flanges, flange adapters, or couplings for grooved-end piping on piping, valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
				2. Ream ends of pipes and tubes and remove burrs.
				3. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
				4. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for foam concentrate. Join flanges with gasket and bolts in accordance with ASME B31.9 “Building Services Piping”.
				5. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1 “Pipe Threads, General Purpose, Inch”. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

Apply appropriate tape or thread compound to external pipe threads.

Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

* + - * 1. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe in accordance with AWWA C606 “Standard for Grooved and Shouldered Joints”. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 “Standard for Grooved and Shouldered Joints” for steel-pipe joints.
				2. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe in accordance with AWWA C606 “Standard for Grooved and Shouldered Joints”. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 “Standard for Grooved and Shouldered Joints” for steel-pipe grooved joints.
				3. Welded Joints: Construct joints in accordance with AWS D10.12M/D10.12 “Guide for Welding Mild Steel Pipe”, using qualified processes and welding operators in accordance with "Quality Assurance" Article.

Shop weld pipe joints where welded piping is indicated.

* + - * 1. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems and with foam concentrate.
			1. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with Drawings and with requirements specified in Section 211313 "Wet-Pipe Sprinkler Systems" or Section 211316 "Dry-Pipe Sprinkler Systems." If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Comply with requirements for piping specified in Section 211313 "Wet-Pipe Sprinkler Systems" or Section 211316 "Dry-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.
				2. Provide concentrate control and drain valves with piping to permit maintenance of foam concentrate with continuous sprinkler-system service.
				3. Install proportioning controller in fire-suppression piping to provide coverage to area indicated on Drawings.
				4. Where installing piping adjacent to equipment, allow space for service and maintenance.
			1. ELECTRICAL CONNECTIONS
				1. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
				2. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
				3. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 “Standard for Electrical Safety in the Workplace” and NECA 1 “Standard for Good Workmanship”.
				4. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

Retain one of two subparagraphs below. First subparagraph cross-references Section 260553 "Identification for Electrical Systems" and should be retained for consistent electrical identification. Second subparagraph is an abbreviated version of product specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

* + - * 1. Connect electrical devices to building's fire-alarm system.
				2. Install a fire-department connection on the supply side of the proportioning controller when required.
			1. LABELING
				1. Install labeling on piping, equipment, and panels in accordance with Section 210553 "Identification for Fire-Suppression Piping and Equipment."
			2. CHARGING SYSTEM
				1. Fill proportioning tanks with foam concentrate after field quality-control testing is complete and satisfactory results have been achieved.
			3. FIELD QUALITY CONTROL

Retain "Testing Agency," "Manufacturer's Field Service," or "Perform tests and inspections" Paragraph below. Retain first option in first paragraph if Owner will hire an independent testing agency.

* + - * 1. Testing Agency: [**Director’s Representative will engage**] [**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 014216 to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform tests and inspections" Paragraph below to require Contractor to perform tests and inspections and retain option 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 "Tests and Inspections" Paragraph below with any combination of paragraphs above.

* + - * 1. Tests and Inspections: Comply with operating instructions and procedures in NFPA 16 “Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems”, Chapter "Acceptance Tests." Include the following tests and inspections to demonstrate compliance with requirements:

Engage the services of a qualified professional Director’s Representative to inspect installed fire-extinguishing systems, prepare installation report, and certify that installation complies with the Contract Documents, calculations, and requirements of authorities having jurisdiction.

Check mechanical items.

Inspect equipment and check mountings for adequate anchoring to substrate.

Check electrical systems.

Flush supply piping.

Perform hydrostatic pressure test.

Perform acceptance test.

Perform proportioning system test.

Perform discharge test.

Flush system piping.

Correct malfunctioning equipment; retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or does not perform as specified and indicated; retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

After installing foam-water fire-extinguishing piping system and after electrical circuitry has been energized, test for compliance with NFPA 16 “Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems”.

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

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

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

* + - * 1. Foam fire-extinguishing piping system will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.

END OF SECTION 211339