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SECTION 211339 - FOAM-WATER SYSTEMS

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.

PART 1 - GENERAL

1.1 SUMMARY

This Section is intended to be used with Section 211313 "Wet-Pipe Sprinkler Systems" or Section 211316 "Dry-Pipe Sprinkler Systems," which specifies sprinkler piping, valves, and valve specialties that make up a complete foam-water system.

A. Section Includes:

1. Concentrate piping and piping specialties.
2. Bladder tanks and proportioning devices.
3. Foam concentrate.
4. Discharge devices.
5. Monitoring and alarm devices.

1.2 SYSTEM DESCRIPTION

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

- A. 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.

1.3 PERFORMANCE REQUIREMENTS

- A. Standard Working Pressure of Piping-System Component: Listed for at least 175 psig (1200 kPa).
- B. Unless authorities having jurisdiction have stricter requirements, minimum design parameters are as follows:
1. Solution: [**3**] <Insert number> percent foam-water solution.

2. Sprinkler Spacing: Maximum of [100 sq. ft. (9.5 sq. m)] <Insert area> per sprinkler, and maximum [12-foot (3.7-m)] <Insert dimension> spacing.
3. Design Density: Minimum [0.16 gpm/sq. ft. (0.108 L/s per sq. m)].
4. Foam Supply: Minimum [10] <Insert number>-minute discharge time.
5. Water Supply: Minimum [60] <Insert number> minutes.
6. Remote Area: Minimum [5000-sq. ft. (476-sq. m)] <Insert area> design area for closed-sprinkler systems. Open-sprinkler systems shall discharge over the entire system area.
7. Sprinkler Temperature Rating: Maximum 250 to 300 deg F (121 to 149 deg C) at a roof or ceiling, and 135 to 170 deg F (57 to 77 deg C) for intermediate sprinklers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Permit-Approved Drawings: Working plans prepared according to NFPA 16 and approved by authorities having jurisdiction. Include hydraulic calculations complying with NFPA 13.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

- A. 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.

Retain first paragraph below if FM-Approved components are required.

- B. FM Global Compliance: Provide components that are FM Approved and that are listed in FM's "Approval Guide."
- C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

PART 2 - PRODUCTS

2.1 CONCENTRATE PIPING MATERIALS

- A. 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.

Schedule 40, black steel piping can be used with AFFF. Some concentrate manufacturers recommend brass or stainless-steel pipe with AR-AFFF.

- B. Schedule 40, Black Steel Pipe: ASTM A 53/A 53M, [**Type E**] <Insert type>, [**Grade B**] <Insert grade> or ASTM A 795/A 795M, [**Type E**] <Insert type>. Pipe ends may be factory or field formed to match joining method.
1. Gray Iron Threaded Fittings, Classes 125 and 250: ASME B16.4.
 2. Gray Iron Pipe Flanges and Flanged Fittings: ASME B16.1.
 3. Malleable Iron Threaded Fittings, Classes 150 and 300: ASME B16.3.

2.2 VALVES

- A. General Valve Requirements:
1. UL listed or FM Approved for use in fire-protection systems.
 2. Compatible with type of foam concentrate used.

2.3 SPECIALTIES

- A. Specialties shall comply with NFPA 16, be compatible with the foam concentrate, and be designed to be drained and cleaned.

Show tank capacity on Drawings.

- B. Foam-Concentrate Storage Tanks: Buna-N, bladder-type proportioning tank complying with UL 162 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.
1. Orientation: [**Horizontal design with saddle**] [**Vertical design with skirt**] support.
- C. Proportioning Controllers: Venturi type complying with UL 162 and of capacity to match design at minimum and maximum flow.
- D. Concentrate Control Valves: Water-operated ball or deluge valve designed to open with flow through the proportioning controller.
- E. Concentrate Strainers: Bronze body and stainless-steel mesh strainer with minimum 0.125-inch (3.2-mm) perforations to remove solids that would block system components.
- F. Pressure Gages: Comply with UL 393; with 3-1/2-inch (90-mm) minimum-diameter dial, 0- to 300-psig (0- to 2070-kPa) dial range, and caption "WATER" or "CONCENTRATE" on dial face.

2.4 FOAM CONCENTRATE

- A. Description: [**AR-**]AFFF liquid concentrate, complying with NFPA 11 and UL 162, for making foam-water fire-extinguishing foam solution.

2.5 DISCHARGE DEVICES

- A. Discharge devices shall be UL listed or FM Approved.

In first paragraph below, retain closed, non-air-aspirating type sprinklers for wet-pipe, dry-pipe, and preaction systems; retain open, non-air-aspirating or air-aspirating type sprinklers for deluge systems.

- B. Sprinklers: [**Closed,**] [**Open,**] [**non-**]air-aspirating type; UL listed or FM Approved and listed for use with type of foam concentrate used.
- C. Spray Nozzles: For foam water; include foam generator and distributing deflector to distribute foam or water.

2.6 MONITORING DEVICES

- A. Valve Supervisory Switches: Single pole, double throw, with normally closed contacts complying with UL 753. Switch shall signal fire-alarm panel or releasing panel when valve is in other than fully open position.
- B. Pressure Switches: Single pole, double throw, UL listed or FM Approved and complying with UL 753. Switch shall signal an alarm condition at the fire-alarm panel or releasing panel when switch is in other than fully open position.
- C. Flow Switches: Single pole, double throw, UL listed or FM Approved and complying with UL 753. Switch shall signal an alarm condition at the fire-alarm panel or releasing panel when switch is in other than fully open position.

2.7 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 283111 "Digital, Addressable Fire-Alarm System," or Section 283112 "Zoned (DC Loop) Fire-Alarm System," which specifies actuation and monitoring devices for preaction and deluge system.

- A. Description: UL listed or FM Approved, low voltage, and surface mounting. Alarm and monitoring devices are specified in Section 283111 "Digital, Addressable Fire-Alarm System" or Section 283112 "Zoned (DC Loop) Fire-Alarm System."

PART 3 - EXECUTION

3.1 CONCENTRATE STORAGE TANK INSTALLATION

Retain "Equipment Mounting" Paragraph below for equipment supported on cast-in-place concrete equipment bases without vibration isolation devices.

- A. Equipment Mounting: Install concentrate storage tanks on cast-in-place concrete equipment bases. Comply with requirements for equipment bases specified in [Section 033000 "Cast-in-Place Concrete."] [Section 033053 "Miscellaneous Cast-in-Place Concrete."]
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct bases to withstand, without damage to equipment, seismic force required by code.
 3. Construct concrete bases [4 inches (100 mm)] [6 inches (150 mm)] [8 inches (200 mm)] <Insert dimension> high and extend base not less than 6 inches (150 mm) in all directions beyond the maximum dimensions of concentrate storage tank unless otherwise indicated or unless required for seismic anchor support.
 4. Minimum Compressive Strength: [5000 psi (34.5 MPa)] [4500 psi (31 MPa)] [4000 psi (27.6 MPa)] [3500 psi (24.1 MPa)] [3000 psi (20.7 MPa)] <Insert value> at 28 days.
 5. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 6. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
 7. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 8. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Install concentrate storage tanks anchored to substrate according to tank manufacturer's written instructions.
- C. Install tanks 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.

3.2 PIPING INSTALLATION

- A. Install piping and other components level and plumb.
- B. Install pipe and fittings, valves, and discharge devices according to requirements listed in NFPA 16, "Installation of Foam-Water Sprinkler and Foam-Water Spray Systems."
1. Support piping using supports and methods according to NFPA 13.
 2. Install monitoring and alarm devices according to NFPA 16 and NFPA 72.

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

- C. Install flanges, flange adapters, or couplings for grooved-end piping on piping, valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for foam concentrate. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. 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:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems and with foam concentrate.

3.3 CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on 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.

- A. 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.
- B. Provide concentrate control and drain valves with piping to permit maintenance of the foam concentrate with continuous sprinkler-system service.
- C. Install proportioning controller in fire-suppression piping to provide coverage to area indicated on Drawings.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Connect electrical devices to building's fire-alarm system. Comply with requirements for wiring and connections in Section 283111 "Digital, Addressable Fire-Alarm System" or Section 283112 "Zoned (DC Loop) Fire-Alarm System."

- F. Install a fire department connection on the supply side of the proportioning controller when required.

3.4 CHARGING SYSTEM

- A. Fill proportioning tanks with foam concentrate after field quality-control testing is complete and satisfactory results have been achieved.

3.5 FIELD QUALITY CONTROL

- A. Inspection: Engage the services of a qualified professional engineer 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.
- B. Comply with operating instructions and procedures in NFPA 16, "Acceptance Tests" Chapter.

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

- C. Perform tests and inspections.

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

- D. Tests and Inspections:
 - 1. After installing foam fire-extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start systems to confirm proper unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

- E. Foam fire-extinguishing piping system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 211339