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SECTION 13955 - FOAM FIRE EXTINGUISHING

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

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 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section is intended to be used with Division 13 Section "Fire-Suppression Piping," which specifies sprinkler piping, valves, and valve specialties that comprise a complete foam-water system.

- A. This Section includes fixed, low-expansion, AFFF fire-extinguishing systems and the following:

Adjust list below to suit Project.

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

- B. Related Sections include the following:

List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.

1. Division 13 Section "Fire-Suppression Piping" for water supply and foam-water piping materials and specialties and controls.

1.3 DEFINITIONS

Retain abbreviations that remain after this Section has been edited.

- A. AFFF: Aqueous film-forming foam.
- B. AR-AFFF: Alcohol-resistant aqueous film-forming foam.
- C. ATS: Acceptance Testing Specifications.

1.4 SYSTEM DESCRIPTION

Convey basic foam system design intent here. This Article is a sample description of a basic system. Edit 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.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard Piping System Component Working Pressure: Listed for at least 175 psig (1200 kPa).
- B. Minimum design parameters to be used with the approval of authorities having jurisdiction 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 spacing> 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.

Revise paragraph below to indicate specific loads determined by Project's structural engineer or refer to loads indicated on Drawings. Verify requirements of authorities having jurisdiction.

- C. Seismic Performance: Fire-suppression piping shall be capable of withstanding the effects of earthquake motions determined according to NFPA 13.

1.6 SUBMITTALS

- A. Product Data: For the following:

Edit list below to suit Project. Retain first subparagraph below if required by authorities having jurisdiction.

1. Piping and equipment seismic restraints.

2. Valves.
3. Proportioning tanks and proportioning devices.
4. Foam concentrate.
5. Discharge devices. Include flow characteristics.
6. Monitoring and alarm devices. Include electrical data.

Retain first paragraph and subparagraphs below if products are required to withstand specific design loads and Architect either has delegated design responsibility to Contractor or wants to review structural data as another way to verify products' compliance with performance requirements. Professional engineer qualifications are specified in Division 1 Section "Quality Requirements."

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following for each hazard area, drawn to scale:
1. Include plans, elevations, sections, details, and attachments to other work. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 2. Wiring Diagrams: Power, signal, and control wiring.
 3. Design Calculations: For amount of foam concentrate required for each hazard area.
 4. Plans: Show the following:
 - a. Foam-solution proportioning tanks and devices, piping, discharge devices, monitoring and alarm devices, and accessories.
 - b. Method of attaching hangers to building structure.
 - c. Fire alarm panel.
 - d. Equipment and furnishings.
- C. Permit-Approved Drawings: Working plans, prepared according to NFPA 16, that have been approved by authorities having jurisdiction. Include design calculations.

Retain paragraph below if procedures for welder certification are retained in "Quality Assurance" Article.

- D. Welding certificates.

Retain first paragraph below if Contractor is responsible for field quality-control testing.

- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For foam fire extinguishing to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "[Closeout Procedures] [Operation and Maintenance Data]," include the following:
1. Valves and specialties.
 2. Proportioning tanks and proportioning devices.
 3. Foam concentrate.
 4. Discharge devices. Include flow characteristics.
 5. Monitoring and alarm devices.

1.7 QUALITY ASSURANCE

Retain first paragraph below for pipe welding. Retain "Welding certificates" Paragraph in "Submittals" Article if retaining below.

- A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

Retain first paragraph below if FMG-approved components are required.

- C. FMG Compliance: Provide components that are FMG approved and that are listed in FMG's "Fire Protection Approval Guide."
- D. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

1.8 EXTRA MATERIALS

Extra materials may not be allowed for publicly funded projects.

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Revise subparagraphs below to suit Project.

- 1. Discharge Devices: Not less than 20 percent of amount of each type installed.
- 2. Foam Concentrate: Not less than 200 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products.

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Retain above for nonproprietary or below for semiproprietary specification. Refer to Division 1 Section "Product Requirements."

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ansul Incorporated.

2. Chemguard Inc.
3. National Foam, Inc.; Division of Kidde Fire Fighting.
4. Viking Corporation (The).
5. **<Insert manufacturer's name.>**

2.2 PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, ASTM A 135, ASTM A 106, or ASTM A 795, Type [E] [S] [E or S] **<Insert type>**, Grade [A] [B] [A or B] **<Insert grade>**, Schedule [40] **<Insert schedule>**, with factory- or field-formed threaded ends.
1. Cast-Iron Threaded Flanges: ASME B16.1.
 2. Malleable-Iron Threaded Fittings: ASME B16.3.
 3. Gray-Iron Threaded Fittings: ASME B16.4.
 4. Butt-Weld Fittings: ASTM A 234/A 234M, Grade WPB, Schedule 40, carbon-steel butt-weld fittings.
 5. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.
 6. Steel Threaded Couplings: ASTM A 865.
- B. Stainless Steel: ASTM A 312/A 312M, Schedule 40, with factory-formed threaded or beveled ends; ASTM A 376/A 376M for seamless pipe; or ASTM A 213/A 213M, ASTM A 249/A 249M, and ASTM A 269 for seamless and welded tubing.
1. Class 150 Threaded Fittings: ASME B16.3 and MSS SP 114.
 2. Butt-Weld Fittings: ASTM A 403/A 403M.
 3. Flanges, Forged Fittings and Flanges, and Socket-Weld Fittings: ASTM A 182/A 182M.
 4. Bar Stock and Compression Fittings: ASTM A 276 and ASTM A 479/A 479M.
- C. Red Brass Pipe: ASTM B 43, Schedule 40, with factory- or field-formed threaded ends.
1. Threaded Flanges and Fittings: ASTM B 584.
- D. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic joining materials.

2.3 VALVES

- A. Ball Valves: Bronze body with threaded or flanged ends. Comply with UL 1091, except with stainless-steel ball instead of disc.

2.4 SPECIALTIES

Show tank capacity on Drawings.

- A. Concentrate Storage Tank: Buna-N, bladder-type proportioning tank complying with UL 162 and ASME Boiler and Pressure Vessel Code: Section VIII. Include bladder, internal piping, fill

and drain, pipe assembly, glass sight gage, piping, and valves. Concentrate to be contained in the bladder.

1. Orientation: [**Horizontal design with saddle**] [**Vertical design with skirt**] support.
- B. Proportioning Controller: Venturi type complying with UL 162 and of capacity to match design at minimum and maximum flow.
- C. Concentrate Control Valve: Water-operated ball or deluge valve designed to open with flow through the proportioning controller.
- D. 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.
- E. Provide devices that comply with NFPA 16, are compatible with the foam concentrate, and are designed to be drained and cleaned.

2.5 FOAM CONCENTRATE

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

2.6 PRESSURE GAGES

- A. Description: 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.

2.7 DISCHARGE DEVICES

- A. General: Discharge devices shall be listed and approved by UL and FMG.

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.
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- B. Sprinklers: [**Closed,**] [**Open,**] [**non-**]air-aspirating type complying with UL 162 and suitable for discharging foam.
- C. Spray Nozzles: Foam-water spray nozzles including foam generator and distributing deflector complying with UL 162 and designed to distribute foam or water in the absence of foam solution in a special pattern peculiar to a particular head.

2.8 MONITORING DEVICES

- A. Valve Supervisory Switches: UL 753, electrical, single pole, double throw, with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

2.9 ALARM DEVICES

Delete this Article for wet- and dry-pipe, closed-sprinkler systems that are specified in Division 13 Section "Fire-Suppression Piping." Division 13 Section "Fire Alarm" specifies preaction and deluge system actuation and monitoring devices.

- A. Description: UL listed or FMG approved, low voltage, and surface mounting. Alarm and monitoring devices are specified in Division 13 Section "Fire Alarm."

PART 3 - EXECUTION

3.1 CONCENTRATE STORAGE TANK INSTALLATION

- A. Install proportioning tanks on concrete bases. Concrete bases are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. 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.

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

- C. **[Install seismic restraints for tanks.]** Anchor tanks to substrate.

3.2 PIPING APPLICATIONS

- A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.

Retain one of first four paragraphs below. Some manufacturers recommend brass or stainless-steel pipe with AR-AFFF.

- B. AFFF-Concentrate Piping: Steel pipe, **[malleable]** **[malleable- or cast]**-iron threaded fittings, and threaded joints.

Retain paragraph above or first paragraph below.

- C. AFFF-Concentrate Piping: Steel pipe with welded fittings and joints.
- D. AR-AFFF-Concentrate Piping: **[Brass]** **[Stainless-steel]** pipe, threaded fittings, and joints.

Retain paragraph above or first paragraph below.

- E. AR-AFFF-Concentrate Piping: Stainless-steel pipe with welded fittings and joints.
- F. Foam-solution piping is specified in Division 13 Section "Fire-Suppression Piping."

3.3 PIPING INSTALLATION

- A. Install piping and other components level and plumb.
- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic pipe installation and joint construction.
- C. Install proportioning tanks anchored to substrate.
- D. Install pipe and fittings, valves, and discharge devices according to requirements listed in NFPA 16, "Installation of Deluge Foam-Water Sprinkler and Foam-Water Spray Systems."
 - 1. Support piping using supports and methods according to NFPA 13.

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

- 2. Install seismic restraints for proportioning tanks and piping systems.
- 3. Install monitoring and alarm devices according to NFPA 16 and NFPA 72.

3.4 CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in Division 13 Section "Fire-Suppression Piping." If Drawings are explicit enough, these requirements may be reduced or omitted.

- A. Piping installation requirements are specified in Division 13 Section "Fire-Suppression Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Provide concentrate control, maintenance service, 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. Install piping adjacent to equipment to allow service and maintenance.
- E. Connect electrical devices to building's fire alarm system. Electrical power, wiring, and devices are specified in Division 13 Section "Fire Alarm."

3.5 LABELING

- A. Install labeling on piping, equipment, and panels according to Division 15 Section "Mechanical Identification."

3.6 CHARGING SYSTEM

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

3.7 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. Include the following tests and inspections to demonstrate compliance with requirements:
 - 1. Check mechanical items.
 - 2. Inspect equipment and fire-extinguishing foam concentrate, and check mountings for adequate anchoring to substrate.
 - 3. Check electrical systems.
 - 4. Flush piping.
 - 5. Perform acceptance test.
 - 6. Perform pressure test.
 - 7. Perform operating test.
 - 8. Perform discharge test.
 - 9. Correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or does not perform as specified and indicated, then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
 - a. Report test results promptly and in writing to Architect and authorities having jurisdiction.
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing foam fire-extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.
 - 3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 4. Operational Test: After electrical circuitry has been energized, start systems to confirm proper unit operation.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 13955