

SECTION 211000 - WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

- A. The extent of this fire sprinkler system shall be as specified herein. Contractor shall be responsible for preparation of design drawings, hydraulic calculations, fabrication and installation for complete fire sprinkler protection for the building.
- B. This Section specifies:
 - 1. Automatic sprinkler systems
 - 2. Materials and equipment specified in this Section include:
 - a. Pipe, fittings, valves, and specialties.
 - b. Sprinklers
 - c. Accessories
- C. Contractor shall be responsible for all permits and fees associated with preparation and approval of Drawings and the installation and approval of fire sprinkler system.
- D. Products furnished but not installed include sprinkler cabinet with spare sprinklers. Furnish to the Owner's maintenance personnel.
- E. Tests and Inspections: Arrange, test, and pay for all tests required by code and Authorities Having Jurisdiction.
- F. Obtain a current water supply test dated not more than 12 months prior to shop drawing submittal.
- G. The hydraulic area of operation may not be reduced as allowed by NFPA 13 for areas utilizing quick response sprinklers.

1.2 REFERENCES

- A. NFPA (National Fire Protection Association) 13, "Installation of Sprinkler Systems", 1999 Edition.
- B. NFPA 24, "Private Fire Service Mains and their Appurtenances", Latest Edition.
- C. NFPA 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection Systems", Latest Edition.
- D. Underwriters Laboratories, "Fire Protection Equipment Directory", Latest Edition.
- E. Factory Mutual Systems, "Approval Guide", Latest Edition.
- F. Applicable local building and fire prevention codes and ordinances.

1.3 DEFINITIONS

- A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).
- B. Other definitions for fire protection systems are listed in NFPA Standards 13 and 24.
- C. Working Plans, also referred to as Fire Protection Drawings as used in this Section means those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the Authority Having Jurisdiction.

1.4 SYSTEM DESIGN REQUIREMENTS

- A. Fire protection system in the building is a Wet Pipe System. Replace 4" fire service with new 6" service and add four risers (five total) to provide protection throughout entire building.
- B. Provide dry-pipe or antifreeze fire protection system for non-heated spaces and other areas of building subject to freezing including the loading docks and canopies, mansards, and balconies. Portions of systems subject to freezing or temperatures below 40° F shall be protected against freezing as required by NFPA 13. The Contractor shall be responsible for repairs and for all costs incurred from damage caused by freezing of the fire protection system.

1.5 SUBMITTALS

- A. Product Data for each type sprinkler, piping, valve, piping specialty, and fire protection specialty specified. Highlight, mark, list or indicate the materials, performance criteria and accessories that are being proposed.
- B. Shop drawings prepared in accordance with NFPA 13 identified as "Working Plans," including hydraulic calculations where applicable, and which have been approved by the Authority Having Jurisdiction. Shop drawings shall be signed and sealed by a Professional Engineer, registered in the state in which the project is located. Shop drawings consisting of the following shall be furnished. Refer to NFPA 13 for additional requirements.
 - 1. Layout drawings of complete overhead sprinkler system indicating relationship of all other trades. Shall include a reflected ceiling plan indicating sprinkler locations.
 - 2. Complete details and sections as required to clearly define and clarify the design indicated.
 - 3. Hydraulic calculations shall be based on a water flow test conducted at the site within twelve (12) months of the submittal of plans for approval. Flow test information shall be documented on shop drawings with an accompanying site plan. A minimum 10% safety factor shall be included in all calculations.
- C. In preparation of shop drawings, Contractor may, at his option, obtain electronic drawing files in [accordance with Division 22 Section, "General Plumbing Requirements"] [AutoCAD or DXF format from the Engineer for a shipping and handling fee of \$200 for a drawing set up to 12 sheets and \$15 per sheet for a set of more than 12 sheets. Contact the Architect for Architect's written authorization. Contractor shall contact the Engineer to obtain the necessary Release Agreement Form, payment procedure, shipping method and drawing format. If a 100MB zip disk or CD-ROM disk is desired, add the appropriate charge indicated. In addition to payment, Architect's written authorization and Engineer's release agreement form must be received before electronic drawing files will be sent.]
- D. Upon completion of the work, provide Record Drawings as required by other sections of these specifications showing location of all fire sprinkler system piping, valves, etc., as finally installed.
- E. Maintenance Data for each type sprinkler, valve, piping specialty, and fire protection specialty for inclusion in operating and maintenance manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."
- F. Welders' qualification certificates.
- G. Test Reports and Certificates include "Contractor's Material & Test Certificate for Aboveground Piping" and "Contractor's Material & Test Certificate for Underground Piping" as described in NFPA 13.

1.6 QUALITY ASSURANCE

- A. Qualifications for Welding Processes and Operators: Comply with the requirements of AWS D10.9, Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing, Level AR-3."
- B. Threaded joints shall conform to ASME B1.20.1, Pipe Threads, General Purpose and the Pipe Fitters Handbook.

- C. Regulatory Requirements: Comply with all standards listed in Section 1.2 and all applicable local requirements.
- D. UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved (FM Insureds only) for fire service.

1.7 EXTRA MATERIALS

- A. Sprinkler Wrenches: Furnish to Owner, 2 sprinkler wrenches for each type of sprinkler installed.
- B. Sprinklers and Cabinets: Furnish extra sprinkler of each style included in the project as required by NFPA 13. Furnish each style with sprinkler cabinet and special wrenches.
- C. Provide hydraulic calculation placard attached to each riser.

1.8 SYSTEM DESCRIPTION

- A. Wet Pipe Fire Sprinkler System (where pressures do not exceed 175 psi)
 - 1. General: Provide a complete sprinkler system in the areas previously described in this Section. The sprinkler system riser and accessories shall be installed where indicated on the Drawings. Provide in accordance with the latest issue of NFPA 13. Coordinate locations of sprinklers with Architectural, Mechanical, and Electrical features of the building. All sprinklers in general shall be in a straight line parallel to the lines of the building, and in a symmetrical pattern with lights and air outlets.
 - 2. Operation:
 - a. The sprinkler system shall be supplied from the underground or standpipe system as shown on the Drawings. A UL listed indicating monitoring valve, UL listed flow switch and inspectors test station shall be provided at each sprinkler system connection. Each flow switch and monitoring valve shall be connected into the building fire alarm system. Any flow through the sprinkler system shall activate an alarm signal at the building fire alarm panel. Reference: Division 26 for WIRING.
 - b. Any flow through the system shall activate the alarm bell and provide an alarm signal at the building fire alarm panel. Each inspectors test station shall include a test valve, sight glass, orifice disk, and auxiliary drain valve. Provide drain valves in all low points of the system. Inspector's test(s) and main drain valve(s) shall be piped to the exterior of the building. Reference: Division 26 for WIRING.

PART 2 - PRODUCTS AND MATERIALS

2.1 EQUIPMENT

- A. All fire protection equipment shall be UL listed and FM approved (FM Insureds only) for its intended use and in conformance with the applicable NFPA documents.

2.2 PIPE AND TUBING MATERIALS

- A. General: Refer to Part 3 Article "PIPE APPLICATIONS" for identification of systems where the below-specified pipe and fitting materials are used.
- B. Steel Pipe:
 - 1. All piping 2-inch and smaller: ASTM A135 or 795, Grade A, Schedule 40, ERW, black steel pipe, threaded or roll grooved ends. All 1-inch piping shall have threaded ends.
 - 2. All piping 2-1/2" and larger: ASTM A135 or 795, Grade A, Schedule 10, ERW, black steel pipe, roll grooved ends.
 - 3. All piping on the exterior of the building shall be externally galvanized.

4. Acceptable alternatives to Schedule 40 and Schedule 10 pipe shall be manufactured to standards recognized by NFPA 13. Threaded pipe shall have a corrosion resistance rating (CRR) of 1.0 or greater. Crimp type couplings shall not be used. Threadable thinwall pipe with CRR less than 1.0 not permitted.

C. Copper Tubing - Drawn Temper: ASTM B88, Type L.

2.3 FITTINGS AND COUPLINGS

- A. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- B. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- C. Steel Fittings: ASTM A234, seamless or welded, for welded joints.
- D. Grooved Mechanical Fittings: ASTM A536, Grade 65-45-12 ductile iron; ASTM A47 Grade 32510 malleable iron; or ASTM A53, Type F or Types E or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings.
- E. Grooved Mechanical Couplings: consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure roll-grooved pipe and fittings. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service.
- F. Cast-Iron Flanges: ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.
- G. Cast Bronze Flanges: ANSI B16.24, Class 150, raised ground face, bolt holes spot faced.
- H. Unions: ASME B16.39, malleable iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces, female threaded ends. Threads shall conform to ASME B1.20.1.

2.4 JOINING MATERIALS

- A. Welding Materials: Comply, with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.
 1. Brazing Filler Metals: AWS A5.8, Classification BAg1 (Silver).
 2. Solder Filler Metals: ASTM B 32, 95-5 Tin-Antimony.
- B. Gasket Materials: thickness, material, and type suitable for fluid or gas to be handled, and design temperatures and pressures.

2.5 HANGERS

- A. Shall be UL listed and shall meet requirements of NFPA 13 for type, dimension and location.

2.6 GENERAL DUTY VALVES

- A. Gate Valves - 2 Inch and Smaller: Body and bonnet of cast bronze, threaded ends, solid wedge, outside screw and yoke (OS&Y), rising stem, screw-in bonnet, and malleable iron handwheel. Valves shall be capable of being repacked under pressure, with valve wide open. 175 psi working pressure where system operating pressure is at or below 175 psi; minimum 250 psi working pressure where system operating pressure exceeds 175 psi.
- B. Gate Valves - 2-1/2 Inch and Larger: Iron body; bronze mounted. Valves shall have solid taper wedge; outside screw and yoke (OS&Y), rising stem; flanged bonnet, with body and bonnet conforming to ASTM A 126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being repacked under pressure, with valve wide open. 175 psi working pressure where system

operating pressure is at or below 175 psi; minimum 250 psi working pressure where system operating pressure exceeds 175 psi.

- C. Butterfly Valves – Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable EPDM seat; wafer, lug or grooved ends; extended neck; hand wheel and gear drive and integral indicating device; built-in tamper proof switch. 175 psi working pressure where system operating pressure is at or below 175 psi; minimum 250 psi working pressure where system operating pressure exceeds 175 psi.
- D. Swing Check Valves: MSS SP-71; Class 175, cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line. Valves shall be listed for minimum 250 psi working pressure where system operating pressure exceeds 175 psi.

2.7 BACKFLOW PREVENTERS

- A. Backflow Preventers: Complying with requirements of ASSE Standard 1013, UL listed and FM approved, reduced pressure zone (RPZ) type. Provide with stainless steel working parts, spring loaded check valves, bronze body ball test cocks, pressure differential relief valve, and OS&Y gate valves and cast iron body with fused epoxy coating or stainless steel body.

2.8 POST INDICATOR VALVE

- A. Resilient Seat Gate Valves - Iron body; bronze mounted. Valves shall have solid taper wedge; non-rising stem; flanged bonnet, with body and bonnet conforming to ASTM A 126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being repacked under pressure, with valve wide open. 175 psi working pressure where system operating pressure is at or below 175 psi; minimum 250 psi working pressure where system operating pressure exceeds 175 psi.

2.9 AUTOMATIC SPRINKLERS

- A. Sprinklers: type and style as indicated or required by application. Sprinkler operating temperatures to comply with NFPA 13. Sprinklers in light hazard areas shall be quick response type.
- B. Sprinkler Finishes: Provide sprinklers with the following finishes:
 - 1. Finished areas: chrome plated semi-recessed pendent type with matching escutcheons or chrome plated sidewall type with matching escutcheons.
 - 2. Unfinished areas and areas not exposed to view: Upright, pendent and sidewall type, rough bronze finish. Sprinklers shall be wax-coated where installed exposed to acids, chemicals, or other corrosive fumes.
- C. Sprinkler Cabinet and Wrench: Provide a finished steel cabinet, suitable for wall mounting, with hinged cover and space for the appropriate quantity of spare sprinklers plus sprinkler wrench. Provide a separate cabinet for each style sprinkler on the project.

2.10 ALARM DEVICES

- A. General: Types and sizes shall mate and match piping and equipment connections.
- B. Water Flow Indicators (Wet-pipe Systems): vane type waterflow detector, rated to 250 psig; designed for horizontal or vertical installation; have 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere 125 volts AC and 0.25 ampere 24 Volts DC; complete with factory-set, field-adjustable retard element to prevent false signals, and tamperproof cover.
- C. Supervisory Switches: SPST, normally closed contacts, designed to signal valve in other than full open position and tamperproof cover.

2.11 FIRE DEPARTMENT CONNECTION

- A. .
- A. Storz Fire Department Connection: Existing to remain.

PART 3 - EXECUTION

3.1 PIPE APPLICATIONS

- A. Piping Below Grade: Refer to Exterior Domestic Water specification.
- B. Piping Above Grade: Black steel for all fire sprinkler system piping located inside the building, not exposed to the elements. Galvanized piping shall be used for all fire sprinkler system piping located on the exterior of the building, exposed to the elements.

3.2 PIPING INSTALLATIONS

- A. Locations and Arrangements: Coordinate installation of horizontal piping with other components. Allow sufficient space above removable ceiling panels to allow for panel removal.
- B. Install system such that all piping is rigidly secured and supported. All ductwork, lights, structural members and main runs of piping shall take precedence over sprinkler piping. Offset sprinkler piping as required to avoid all ductwork, lights, structural members and piping. Cutting of structural members for passage of sprinkler pipes or hangers will not be permitted. All horizontal piping in ceiling space shall be at an elevation above the top of light fixtures and air outlets to allow for access to light fixtures and air outlets without removing horizontal piping. Route all sprinkler piping and provide all offsets, bends, and elbows around all mechanical, electrical, and structural members as required. In areas with ceilings, piping shall be routed concealed, above ceiling. In areas without ceilings, piping shall extend as high as possible.
- C. Deviations from approved "Working Plans" for sprinkler piping require written approval of the Authority Having Jurisdiction. Written approval shall be on file with the Engineer prior to deviating from the approved "Working Plans."
- D. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.
- E. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- F. Install unions in pipes 2 inch and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.
- G. Install flanges or flange adapters on valves, apparatus, and equipment having 2-1/2 inch and larger connections.
- H. Hangers and Supports: Comply with the requirements of NFPA 13. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake if required by the applicable building code, designed in accordance with NFPA 13. Locate hangers at or directly adjacent to the joist panel points. Provide two nuts on threaded supports to securely fasten the support.
- I. Make connections between underground and aboveground piping using an approved transition piece strapped or fastened to prevent separation.
- J. Install mechanical sleeve seal at pipe penetrations in basement and foundation walls. Refer to Division 22 Section "Basic Piping Materials and Methods."
- K. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.

- L. Install pressure gauge on the riser or feed main at or near each test connection. Provide gauge with a connection not less than 1/4 inch and having a soft metal seated globe valve arranged for draining pipe between gauge and valve. Install gauges to permit removal, and where they will not be subject to freezing.

3.3 PIPE JOINT CONSTRUCTION

- A. Welded Joints: AWS D10.9, Level AR-3.
- B. Threaded Joints: conform to ANSI B1.20.1, tapered pipe threads for field cut threads and Pipe Fitter's Handbook. Join pipe, fittings, and valves as follows:
 - 1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - 2. Align threads at point of assembly.
 - 3. Apply appropriate tape or thread compound to the external pipe threads.
 - 4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
 - 5. Damaged Threads: Do not use pipe with threads that are corroded, or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.
- C. Flanged Joints: Align flanged surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.
- D. Mechanical Grooved Joints: roll grooves on pipe ends dimensionally compatible with the couplings.
- E. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
 - 1. WARNING: Some filler metals contain compounds that produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.
- F. Soldered Joints: Comply with the procedures contained in the Copper Development Association "Handbook for Fire Sprinkler Systems."
- G. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

3.4 VALVE INSTALLATIONS

- A. General: Install fire protection specialty valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13, and the Authority Having Jurisdiction.
- B. Gate Valves: Install supervised-open gate valves so located to control all sources of water supply except fire department connections. Where there is more than one control valve, provide permanently marked identification signs indicating the portion of the system controlled by each valve. Refer to Division 22 Section "Identification for Plumbing Piping & Equipment" for valve tags and signs.
- C. Butterfly Valves: Install supervised-open butterfly valves so located to control all sources of water supply except fire department connections. Where there is more than one control valve, provide permanently marked identification signs indicating the portion of the system controlled by each valve. Refer to Division 22 Section "Identification for Plumbing Piping & Equipment" for valve tags and signs.
- D. Hose Outlet Valves: Install 1-1/2 inch hose outlet valves with brass cap and chain at each standpipe outlet for hose connections at the stage.

3.5 BACKFLOW PREVENTER INSTALLATIONS

- A. Install backflow preventer at each fire protection entry in compliance with the plumbing code and Authority Having Jurisdiction. Locate in an accessible and testable location. Install air gap fitting and pipe relief outlet drain without valves to nearest floor drain.

3.6 POST INDICATOR VALVE

- A. Install post indicator valve on the building wall or on the underground supply, as indicated on the Drawings. Post indicator valve shall be electronically supervised-open.

3.7 SPRINKLER INSTALLATIONS

- A. Use proper tools to prevent damage during installations.
- B. Areas with ceilings: Install sprinklers not less than 6-inches from the edge of a ceiling tile in areas with suspended ceilings, in a symmetrical pattern with lights and outlets. Install sprinklers in a symmetrical pattern with lights and outlets in all other areas with ceilings.
- C. Areas without ceilings: Install pendent or upright sprinklers in accordance with NFPA 13.
- D. Sprinkler spacing shall conform to NFPA 13 and shall not exceed 256 SF per sprinkler (applies to extended coverage sprinklers in unfinished areas).

3.8 FIELD QUALITY CONTROL

- A. Flush, test, and inspect sprinkler piping systems in accordance with NFPA 13.
- B. Replace piping system components that do not pass the test procedures specified, and retest repaired portion of the system.

3.9 COMMISSIONING

- A. Sprinkler Systems: Test per NFPA 13, NFPA 25 and local authorities requirements. Submit Contractor's Material & Test Certificates for Above Ground Piping. Submit certificates of completion to Authority Having Jurisdiction and Owner. :
 - 1. After completion of all installation, tests, etc., and prior to the opening date, the Sprinkler Subcontractor shall instruct the building personnel in the operation of the sprinkler system. Special care shall be taken to make sure the building personnel:
 - a. Will immediately recognize whether the monitoring zone gate valves are in an Open position or a Closed position.
 - b. Will know how to drain the system.
 - c. Will know how to test the flow switches and alarm system.
 - d. Will know how to make complete weekly inspection.
 - e. Will know how to perform periodic maintenance of the Fire Sprinkler System.
- B. Fire Alarm Equipment: Test per NFPA 25, NFPA 72 and local authorities requirements in the presence of the Owner. Submit certificates of completion to Authority Having Jurisdiction and Owner.
- C. Backflow Preventer: Test per local authorities requirements and submit certificates of completion to Authority Having Jurisdiction and provide Owner copies of the certificates.

END OF SECTION 211000