

SECTION 21 13 16
DRY-PIPE FIRE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Modify existing automatic dry pipe fire extinguishing sprinkler systems for complete fire protection coverage throughout attic space.

1.2 RELATED WORK

- A. Section 09 91 00, PAINTING.
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- C. Section 28 31 00, FIRE DETECTION AND ALARM.

1.3 DESIGN CRITERIA

- A. Modify existing automatic dry pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions of NFPA 13, hydraulic calculations using the area/density method for uniform distribution of water over the design area for ordinary hazard occupancy. Each system shall include materials, accessories, and equipment inside and outside the building to provide each system complete and ready for use. Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed working drawings to be submitted for approval. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and air supply diffusers. Devices and equipment for fire protection service shall be UL Fire Protection Equipment Directory listed or FM Approval Guide approved for use in dry pipe sprinkler systems.
 - 1. Location of Sprinkler Heads: Spacing of sprinklers and position and orientation of sprinklers in relation to the ceiling, walls, and obstructions shall conform to NFPA 13 for ordinary hazard occupancy; except for discharge density greater than 0.20 gpm per sq ft the spacing of sprinkler heads shall not exceed that for extra hazard occupancy. Uniformly space sprinklers on the branch piping.
 - 2. Water Distribution: Distribution shall be uniform throughout the area in which the sprinkler heads will open. Discharge from individual sprinklers in the hydraulically most remote area shall be not less than 100 percent of the specified density.
 - 3. Density of Application of Water: Size pipe to provide the specified density when the system is discharging the specified total maximum required flow. Application to horizontal surfaces below the sprinklers shall be 0.15 gpm per sq ft.

4. Sprinkler Design Area: Area shall be the hydraulically most remote 1500 sq ft area as defined in NFPA 13.
5. Outside Hose Allowances: Hydraulic calculations shall include an allowance of 250 gpm for outside hose streams.
6. Friction Losses: Calculate losses in piping in accordance with the Hazen-Williams formula with 'C' value of 100 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping. Velocity in the sprinkler piping shall be limited to a maximum of 20 ft/sec.
7. Water Supply: Base hydraulic calculations on a new hydrant flow test data. Provide 10 psi cushion between total calculated demand and the water supply.

1.4 SUBMITTALS

- A. General: Submit 5 copies in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Working Drawings: Prepare 24 by 36 inch detail working drawings of sprinkler heads and piping system layout in accordance with NFPA 13, "Working Drawings (Plans)." Show data essential for proper installation of each system. Show details, plan view, elevations, and sections of the systems supply and piping. Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams. Show location and orientation of sprinkler heads in relation to obstructions. Submit drawings signed by a registered fire protection engineer.
- C. As-Built Drawings: After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes. Submit 24 by 36 inch drawings on reproducible mylar film with title block similar to full size contract drawings. Furnish the as-built (record) working drawings in addition to as-built contract drawings required by Division 1, "General Requirements."
- D. Product Data: Annotate descriptive data to show the specific model, type, and size of each item.
 1. Piping
 2. Valves, including gate, check, and globe
 3. Water motor alarms
 4. Sprinkler heads
 5. Pipe hangers and supports
 6. Mechanical couplings

E. Test Reports: Preliminary tests on piping system

F. Certificates:

1. Qualifications of Installer: Prior to installation, submit data showing that the Contractor has successfully installed systems of the same type and design as specified herein, or that Contractor has a firm contractual agreement with a subcontractor having such required experience. Data shall include names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
2. Qualifications of System Technician: Installation drawings, shop drawing and as-built drawings shall be prepared, by or under the supervision of, an individual who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in automatic sprinkler system program. Contractor shall submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Factory Mutual Engineering Corporation (FM):
Approval Guide.....www.approvalguide.com
- C. National Fire Protection Association (NFPA):
13.....(2016) Standard for the Installation of
Sprinkler Systems
70.....(2011) National Electrical Code
- D. Society for Protective Coatings (SSPC):
SSPC Paint 25.....(1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil
Primer for Use Over Hand Cleaned Steel, Type I
and Type II
- E. U.S. General Services Administration (GSA):
CID A-A-2962.....(Rev A; Notice 2) Enamel, Alkyd, Gloss, Low VOC
Content

F. Underwriters Laboratories, Inc. (UL):

Current Edition.....Fire Protection Equipment Directory

www.database.ul.com

PART 2 PRODUCTS

2.1 ABOVEGROUND PIPING SYSTEMS

- A. Provide fittings for changes in direction of piping and for connections. Make changes in piping sizes through tapered reducing pipe fittings; bushings will not be permitted. Perform welding in the shop; field welding will not be permitted.
1. Sprinkler Piping: NFPA 13, except as modified herein. Steel piping shall be Schedule 10 or 40 for sizes less than 8 inches. Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1.5 inches and larger. Fittings shall be UL Fire Protection Equipment Directory listed or FM Approval Guide approved for use in dry pipe sprinkler systems. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer. Steel piping with wall thickness less than Schedule 30 shall not be threaded. Steel piping shall be galvanized. Sprinkler pipe and fittings shall be metal.
 2. Sprinkler Heads: Provide nominal 0.50 inch or 0.53 inch orifice quick response sprinkler heads. No o-rings will be permitted in sprinkler heads. Release element of each head shall be of the ordinary temperature rating or higher as suitable for the specific application. Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates. Automatic sprinklers installed in the pendent position shall be of the dry-pendent type.
 3. Water Motor Alarms: Provide alarms of the approved weatherproof and guarded type, to sound locally on the flow of water in each corresponding sprinkler system. Mount alarms on the outside of the outer walls of each building at a location as directed. Provide separate drain piping directly to exterior of building.

4. Pipe Hangers and Supports: Provide in accordance with NFPA 13.
Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer.
5. Inspector's Test Connection: Provide test connections approximately 6 feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the hydraulically most remote part of each system. Provide test connection piping to a location where the discharge will be readily visible and where water may be discharged without property damage. Provide discharge orifice of same size as corresponding sprinkler orifice. Provide a precast concrete splash block under each exterior discharge orifice.

2.2 PIPE SLEEVES

- A. General: Provide where piping passes entirely through walls, floors, and roofs. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs. Provide one inch minimum clearance between exterior of piping and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of the sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with UL listed fill, void, or cavity material.
1. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are grouted smooth.
2. Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs: Provide 26 gage galvanized steel sheet.

2.3 ESCUTCHEON PLATES

- A. Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings. Keep the interior and ends of new piping and existing piping affected by Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position. Provide Teflon pipe thread paste on male threads.

1. Electrical Work: Provide electrical work associated with this section under Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, except for control and fire alarm wiring. Provide fire alarm system under Section 28 31 00, FIRE DETECTION AND ALARM. Provide control and fire alarm wiring, including connections to fire alarm systems, under this section in accordance with NFPA 70. Provide wiring in rigid metal conduit or intermediate metal conduit, except electrical metallic tubing conduit may be used in dry locations not enclosed in concrete or where not subject to mechanical damage.
2. Field Painting: Painting of sprinkler systems above suspended ceilings and in crawl spaces is not required. Clean, prime, and paint new sprinkler system piping, valves, hangers, accessories, and miscellaneous metal work as specified in Section 09 91 00, PAINTING and herein. Clean surfaces prior to painting. Immediately after cleaning, prime metal surfaces with SSPC Paint 25 or SSPC Paint 25 metal primer applied to a minimum dry film thickness of 1.5 mils. Exercise care to avoid painting sprinkler heads and operating devices. Upon completion of painting, remove materials which were used to protect sprinkler heads and operating devices which have been inadvertently painted and provide new clean sprinkler heads and operating devices of the proper type. Finish primed surfaces as follows:
 - a. Systems in Finished Areas: Finished areas are defined as areas where walls or ceilings are painted or are constructed of a prefinished material. Paint primed surfaces with two coats of

paint to match adjacent surfaces, except paint valves and operating accessories with two coats of gloss red enamel. Provide piping with 2 inch wide red bands spaced at maximum 20 feet intervals throughout the piping system. Bands shall be gloss red enamel or self-adhering plastic.

- b. Systems in Unfinished Areas: Paint piping in valve rooms and attics with CID A-A-2962 gloss red enamel applied to a minimum dry film thickness of 1.6 mils.

3.2 FIELD QUALITY CONTROL

- A. Perform test to determine compliance with the specified requirements in the presence of the COR. Test, inspect, and approve piping before covering or concealing.

- 1. Preliminary Tests: Hydrostatically test each system at 50 psig above normal system static pressure or 200 psig, whichever is greater, for a 2-hour period with no leakage or reduction in pressure. Flush piping with potable water and air test each system in accordance with NFPA 13. Piping above suspended ceilings shall be tested, inspected, and approved before installation of ceilings. Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. Water shall be delivered to the system test connection in not more than 60 seconds, starting at the normal air pressure on the system and at the time of a fully opened inspection test connection. When tests have been completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13.
- 2. Formal Tests and Inspections: Do not submit a request for formal test and inspection until the preliminary test and corrections are completed and approved. Submit a written request for formal inspection at least 15 days prior to inspection date. An experienced technician regularly employed by the system installer shall be present during the inspection. At this inspection, repeat any or all of the required tests as directed. Correct defects in work provided by the Contractor, and make additional tests until the systems comply with contract requirements. Furnish appliances, equipment, instruments, connecting devices, and personnel for the tests. The VA will furnish water for the tests. The COR will witness formal tests and approve systems before they are accepted.

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