

SECTION 21 1314W - AUTOMATIC SPRINKLER SYSTEMS (WET PIPE SYSTEMS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 21 0000, "General Fire Suppression Requirements."

1.2 SUMMARY

A. Section Includes:

- 1. Aboveground fire protection pipe, fittings, and specialties inside the building from 1'-0" above finished floor, 1'-0" inside the exterior wall, or connection provided in the domestic water line as shown on the drawings.
- 2. Fire-protection valves.
- 3. Fire-department connections.
- 4. Sprinklers.
- 5. Alarm devices.
- 6. Pressure gages.
- 7. Backflow preventers.

1.3 SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.
- B. Deluge and/or Pre-Action Systems: Provide as required for specific applications according to NFPA and FM Global requirements.

1.4 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a properly licensed and qualified Professional Engineer, using performance requirements and design criteria indicated. Professional Engineer shall seal (stamp) hydraulic calculations and sprinkler system drawings. Professional Engineer shall be registered in the State of Illinois.
 - 1. The Contractor shall perform a flow test in accordance with NFPA or obtain water design data from the Local Water Department if data is not shown on the drawings.

- C. Sprinkler system design shall be approved by the authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
 - 2. Sprinkler Occupancy Hazard Classifications, densities, and head spacing shall be as indicated on the drawings.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Qualification Data: For qualified Installer and Professional Engineer.
- E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- F. Welding certificates.
- G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- H. Field quality-control reports.
- I. Operation and maintenance data.
- J. At closeout, Northwestern University Maintenance Requirement forms, refer to Division 01 for more information.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test with corrections to the flow obtained per NFPA 291 Part 4.12 System Correction.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a properly qualified and licensed Professional Engineer.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

- C. 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.
- D. NFPA Standards and Other Requirements: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
1. NFPA 13, "Installation of Sprinkler Systems."
 2. NFPA 14, "Standpipe and Hose Systems."
 3. NFPA 70, "National Electrical Code."
 4. NFPA 72, "National Fire Alarm and Signaling Code."
 5. NFPA 291, "Fire Flow Testing and Marking of Hydrants."
 6. NFPA 1963, "Fire Hose Connections."
 7. Comply with the Illinois Building Code and Fire Code, and required references, the City of Chicago Building Code, Fire Prevention Code, and required references, and with all other requirements of the local Authority Having Jurisdiction (AHJ).
- E. Comply with FM Global requirements for general installation of systems, prevention and control of internal corrosion in automatic sprinkler systems, installations in any residential occupancies, for deluge, and pre-action valves and accessories, for cross connections, for pressure reducing valves for fire protection service, for system inspections, testing and maintenance, for pipe friction losses for hydraulics of fire protection systems, for fire protection pumps, for fixed water spray systems for fire protection, for water mist systems, for installation/maintenance of fire service mains, for standpipes and hose systems, and for fire protection water demand for non-storage sprinkled properties.
- F. WARRANTIES
1. 5 years, see Section 21 0000.

PART 2 - PRODUCTS

- 2.1 All materials and components shall meet local jurisdiction, NFPA, and FM Global requirements.
- 2.2 PIPING MATERIALS
- A. Comply with requirements in "Piping Schedule" Article at the end of this Section for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.
- 2.3 STEEL PIPE AND FITTINGS
- A. Standard Weight, Black-Steel Pipe: ASTM A 53 Schedule 40. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 30, Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M,; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- C. Thinwall Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

- D. Black Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- E. Uncoated, Steel Couplings: ASTM A 865, threaded.
- F. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- G. Malleable- or Ductile-Iron Unions: UL 860.
- H. Cast-Iron Flanges (must be approved by the University): ASME 16.1, Class 125.
- I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- J. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
- K. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Corcoran Piping System Co.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - 2. Pressure Rating: 175 psig minimum.
 - 3. Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.
 - 1. Full-face gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
 - 1. Valves shall be UL listed or FM approved, and meet FM Global requirements.
 - 2. Minimum Pressure Rating: 175 psig.
- B. Check Valves:
 - 1. Standard: UL 312.

2. Pressure Rating: 250 psig minimum.
3. Type: Swing check.
4. Body Material: Cast iron.
5. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:

1. Standard: UL 262.
2. Pressure Rating: 175 psig.
3. Body Material: Bronze.
4. End Connections: Threaded.

D. Iron OS&Y Gate Valves:

1. Standard: UL 262.
2. Pressure Rating: 250 psig minimum.
3. Body Material: Cast or ductile iron.
4. End Connections: Flanged or grooved.

E. Ball Valves 2" and smaller:

1. Standard UL 1091.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Bronze.
4. End Connections: Threaded.

F. Indicating-Type Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psig minimum.
3. Valve Type: Butterfly.
4. Body Material: Cast or ductile iron.
5. End Connections: Flanged, grooved, or wafer.
6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.

2.6 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.

2.7 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.

5. End Connections: Flanged or grooved.

B. Riser Check Valves with Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Reliable Automatic Sprinkler Co., Inc.
 - b. Victaulic Company.
 - c. Viking Corporation.
2. Standard: UL 193.
3. Design: For vertical installation.
4. Trim Package: All necessary nipples and fittings, main drain valve, and gauges.

C. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175 psig minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4.
5. End Connections: Threaded.

2.8 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Standard: UL 405.
2. Type: Flush, for wall mounting.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Corrosion-resistant metal.
5. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
6. Caps: Brass, lugged type, with gasket and chain.
7. Escutcheon Plate: Rectangular, brass, wall type.
8. Outlet: With pipe threads.
9. Body Style: Horizontal.
10. Number of Inlets: Two.
11. Outlet Location: Back.
12. Escutcheon Plate Marking: Similar to " AUTO SPKR", and if dual service, mark the 2nd service as well per University requirements.
13. Finish: Polished chrome plated.
14. Outlet Size: 4".
15. For the Evanston campus, provide a weatherproof, visual fire alarm signal device above the connection along with a weatherproof box/cabinet/panel for a future audible device.

2.9 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 175 psig minimum.

3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-T and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

C. Zone/Floor Control Module:

1. UL listed, FM approved complete with flow switch, pressure gage, and ball valve.

D. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

E. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

F. Adjustable Drop Nipples:

1. Standard: UL 1474.
2. Pressure Rating: 250 psig minimum.
3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
4. Size: Same as connected piping.
5. Length: Adjustable.
6. Inlet and Outlet: Threaded.

G. Braided Flexible, Sprinkler Hose Fittings:

1. Standard: UL 1474.
2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.

3. Pressure Rating: 175 psig minimum.
4. FM approved.
5. Size: Same as connected piping, for sprinkler.

2.10 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc.
3. Viking Corporation.
4. Victaulic Company.

- B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
3. Sprinklers shall be used in accordance with their listed coverage limitations.
4. Sprinkler temperature classification shall be ordinary **[intermediate] [as indicated]**.
5. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13.

- C. Sprinkler Types:

1. Concealed Sprinkler: Concealed sprinkler shall be chrome-plated quick-response type and shall have a nominal 1/2 inch or 17/32 inch orifice. Cover to be color selected by Architect.
2. Recessed Sprinkler: Recessed sprinkler shall be chrome-plated quick-response type and shall have a nominal 1/2 inch or 17/32 inch orifice.
3. Upright Sprinkler: Upright sprinkler shall be chrome-plated quick-response type and shall have a nominal 1/2 inch or 17/32 inch orifice.
4. Sidewall Sprinkler: Sidewall sprinkler shall have a nominal 1/2 inch orifice. Sidewall sprinkler shall have a polished chrome finish. Sidewall sprinkler shall be the quick-response type.
5. Intermediate Level Rack Sprinkler: Intermediate level rack sprinkler shall be of the upright or pendent type with nominal 13 mm 1/2 inch orifice and minimum "K" factor of 5.5. The sprinkler shall be equipped with a deflector plate to shield the fusible element from water discharged above it.

- D. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Sidewall Mounting: Chrome-plated steel, one piece, flat.

- E. Sprinkler Guards

1. Guards shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers in sports activity areas, and as otherwise noted on drawings.

2.11 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Water-Flow Indicators:
 - 1. Standard: UL 346.
 - 2. Water-Flow Detector: Electrically supervised.
 - 3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
 - 4. Type: Paddle operated.
 - 5. Pressure Rating: 250 psig.
 - 6. Design Installation: Horizontal or vertical.
- C. Valve Supervisory Switches:
 - 1. Standard: UL 346.
 - 2. Type: Electrically supervised.
 - 3. Components: Single-pole, double-throw switch with normally closed contacts.
 - 4. Design: Signals that controlled valve is in other than fully open position. Also, external tamper switches or external wired tamper switches are required.

2.12 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch (90- to 115-mm) diameter.
- C. Pressure Gage Range: 0 to 300 psig (0 to 2070 kPa).
- D. Water System Piping Gage: Include "WATER" label on dial face, as directed by the University/AHJ.

2.13 BACKFLOW PREVENTERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide a Conbraco RPDA reduced pressure detector assembly backflow preventer. The assembly shall consist of two independent tri-link check valves within a single housing, sleeve access port, four test cocks and two drip tight shut-off valves. Tri-link checks shall be removable and serviceable, without the use of special tools.
- B. The bypass assembly shall consist of a meter, which registers in either gallon or cubic measurement, a double check backflow assembly and required test cocks
- C. The housing shall be constructed of 304 Schedule 40 stainless steel pipe with grooved end connections. Tri-link checks shall have chloramine resistant silicone discs and in operation shall produce drip tight closure against reverse flow caused by backpressure or back-siphonage.
- D. UL/FM grooved gear operated butterfly valves with tamper switches.

- E. Refer to Division 22 for other requirements for when connection to domestic water mains or services. These required backflow preventers shall be furnished by the project plumbing contractor but installed by the Division 21 contractor. Refer to Section 22 2114.

2.14 SPECIAL COMPONENT ELECTRICAL CONTACT REQUIREMENTS

- A. All devices/components required to be monitored electrically for flow, tamper, etc, shall have two sets of contacts, one for the fire alarm system connection and one for the Division 25 system connection.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

- A. If applicable, connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Division 22 Section "Domestic Water Distribution System."
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

- J. Install alarm devices in piping systems.
- K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- M. Fill sprinkler system piping with water.
- N. For multi-story buildings, refer to Section 21 0000 for floor branch check valve requirements.

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- D. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- E. 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.
- F. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- 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.

3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install backflow preventers at connection to potable-water-supply source.
- D. Specialty Valves and Switch Requirements:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.
 - 3. Valve supervisory switches shall be provided for each point where the water supply to the system or parts of the system can be shut off. Valves grouped at a common location can be combined into the same zone to a maximum of 5. In no case shall valves be concealed.
- E. All devices/components required to be monitored electrically for flow, tamper, etc, shall have two sets of contacts, one for the fire alarm system connection and one for the Division 25 system connection.

3.5 SPRINKLER INSTALLATION AND APPLICATION

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels or where indicated on Architectural Reflected Ceiling Plans, unless the sprinklers can be otherwise be aesthetically located, but off-center locations must be approved ahead of time individually by the University/Architect.
- B. Quick response sprinklers are required in offices, classrooms, hallways, assembly areas, atriums, sleeping rooms, dining rooms, and most lab areas. Ordinary response sprinklers shall be used in storage areas, mechanical rooms, janitor closets, and areas where special coated sprinklers are required. Temperature ratings shall be the maximum expected ceiling temperatures.
- C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, fire-department connection.
- B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.7 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.
- B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.8 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.
- B. Sleeves are not required for core-drilled holes.
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.
- D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- E. Install sleeves in new partitions, slabs, and walls as they are built.
- F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."
- G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."
- H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.
- I. Seal space outside of sleeves in concrete slabs and walls with grout.
- J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.
- K. Install sleeve materials according to the following applications:
 1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe.
 2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe.
 - a. Extend sleeves 2 inches above finished floor level.
 - b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements for flashing in Division 07 Section "Sheet Metal Flashing and Trim."
 3. Sleeves for Piping Passing through Gypsum-Board Partitions:

- a. Galvanized-steel-sheet sleeves for pipes NPS 6 (DN 150) and larger.
 - 4. Sleeves for Piping Passing through Exterior Concrete Walls:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
 - b. Cast-iron wall-pipe sleeves for pipes NPS 6 and larger.
 - c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
 - 5. Sleeves for Piping Passing through Interior Concrete Walls:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
 - b. Galvanized-steel-sheet sleeves for pipes NPS 6 and larger.
 - L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section "Penetration Firestopping."
- 3.9 SLEEVE SEAL INSTALLATION
- A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.
 - B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- 3.10 IDENTIFICATION
- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
 - B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section covering identification for electrical systems.
- 3.11 FIELD QUALITY CONTROL
- A. Perform tests and inspections.
 - B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter, and to FM global requirements.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Verify that equipment hose threads are same as local fire-department equipment.

- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.12 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

3.13 PIPING SCHEDULE

- A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
 - 1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight or Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be one of the following:
 - 1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight or Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 3. Thinwall black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.14 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: [**Recessed sprinklers**] [**Concealed sprinklers**]
 - 3. Wall Mounting: Sidewall sprinklers.
 - 4. Spaces Subject to Freezing: [**Pendent, dry sprinklers**] [**Sidewall, dry sprinklers**]
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
 - 1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
 - 2. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

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3. **[Upright]** and **[Sidewall]** Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

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