## DIVISION 21 – FIRE PROTECTION

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DIVISION 21

FIRE PROTECTION
SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
5. Pressure gages.

B. Related Sections:

1. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.

1.2 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

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.

1.4 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design of sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer registered in the state of New Jersey, using performance requirements and design criteria indicated.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent or 10psi, whichever is greater, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications shall be as indicated on Rock Brook drawings.
3. Minimum Density for Automatic-Sprinkler Piping Design:
   a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft.area.
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area

c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area

4. Maximum Protection Area per Sprinkler:

a. Office Spaces: 225 sq. ft.
b. Laboratory Areas: 130 sq. ft.
c. Storage Areas: 130 sq. ft.
d. Mechanical Equipment Rooms: 130 sq. ft.
e. Other Areas: According to NFPA 13 and unless otherwise indicated.

5. Total Combined Hose-Stream Demand Requirement:

a. Light-Hazard Occupancies: 100 gpm
b. Ordinary-Hazard Occupancies: 250 gpm


1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Submit field changes for approval. For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work. Shop drawings shall also include location of all pipe supports and elevation of mains. Subsequent submission of shop drawings shall clearly identify revisions with a revision bubble and description.

C. Delegated-Design Submittal: Sprinkler systems shall comply with performance requirements and design criteria shown on the drawings. Delegated design submittal is to include hydraulic calculations and shop drawings, signed and sealed by the qualified professional engineer responsible for their preparation, licensed in the state of the project location.

D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping and equipment.
2. Storm Drain piping
3. HVAC hydronic piping, ductwork, and equipment.
4. Ceiling elevations—sprinkler mains and branch piping shall be elevated or relocated to accommodate changes in ceiling elevation.
5. Items penetrating finished ceiling include, but are not limited to, the following:
   a. Lighting fixtures
   b. Air outlets and inlets
   c. Folding doors

E.C. Qualification Data: For qualified Installer and professional engineer.

F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
G.D. Welding certificates.

H. Fire-hydrant flow test report. This shall include date and location of test. Date of test shall be recent, within 1 year of submittal, unless more recent test is required by the AHJ.

I.E. 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."

J.F. Field quality-control reports.

K.G. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

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.

   a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified 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: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

   1. NFPA 13, "Installation of Sprinkler Systems."

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

   1. Notify Owner no fewer than three days in advance of proposed interruption of sprinkler service.
   2. Do not proceed with interruption of sprinkler service without Owner's written permission.
1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Coordinate layout of piping with changes in ceiling elevation.

C. Coordinate layout of fire pump room.

1.9 EXTRA MATERIALS

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

   1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Black Steel Pipe: ASTM A 53. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black Steel Pipe: ASTM A 135. Pipe ends to match joining method.

C. Black Steel Pipe Nipples: ASTM A 733, standard-weight, seamless steel pipe with threaded ends.

D. Cast Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.


G. Grooved-Joint, Steel-Pipe Appurtenances:

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Anvil International, Inc.
b. Corcoran Piping System Co.
c. National Fittings, Inc.
d. Shurjoint Piping Products.
e. Tyco Fire & Building Products LP.
f. Victaulic Company.

2. Pressure Rating: 175 psig minimum.

2.3 PIPING JOINING MATERIALS

   1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
   2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type 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.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:
   1. Valves shall be UL listed and FM approved.

B. Ball Valves:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Anvil International, Inc.
      b. Victaulic Company.
   2. Standard: UL 1091 except with ball instead of disc.
   3. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
   4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
   5. Valves NPS 3: Ductile-iron body with grooved ends.

C. Bronze Butterfly Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fivalco Inc.
   b. Global Safety Products, Inc.
   c. Milwaukee Valve Company.

2. Standard: UL 1091.


5. End Connections: Threaded.

D. Iron Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Anvil International, Inc.
   b. Fivalco Inc.
   c. Global Safety Products, Inc.
   d. Kennedy Valve; a division of McWane, Inc.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Pratt, Henry Company.
   h. Shurjoint Piping Products.
   i. Tyco Fire & Building Products LP.
   j. Victaulic Company.

2. Standard: UL 1091.


4. Body Material: Cast or ductile iron.

5. End Connections: Grooved.

E. Check Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AFAC Inc.
   b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   c. Anvil International, Inc.
   d. Clow Valve Company; a division of McWane, Inc.
   e. Crane Co.; Crane Valve Group; Crane Valves.
   f. Crane Co.; Crane Valve Group; Jenkins Valves.
   g. Crane Co.; Crane Valve Group; Stockham Division.
   h. Fire-End & Croker Corporation.
   i. Fire Protection Products, Inc.
   j. Fivalco Inc.
   k. Globe Fire Sprinkler Corporation.
   l. Groeniger & Company.
m. Kennedy Valve; a division of McWane, Inc.

n. Matco-Norca.

o. Metraflex, Inc.

p. Milwaukee Valve Company.

q. Mueller Co.; Water Products Division.

r. NIBCO INC.

s. Potter Roemer.

t. Reliable Automatic Sprinkler Co., Inc.
u. Shurjoint Piping Products.
v. Tyco Fire & Building Products LP.
w. United Brass Works, Inc.
x. Venus Fire Protection Ltd.
y. Victaulic Company.
z. Viking Corporation.

aa. Watts Water Technologies, Inc.


3. Pressure Rating: 250 psig minimum

4. Type: Swing check.

5. Body Material: Cast iron.

6. End Connections: Flanged or grooved.

F. Bronze OS&Y Gate Valves:

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

   a. Crane Co.; Crane Valve Group; Crane Valves.
   
   b. Crane Co.; Crane Valve Group; Stockham Division.
   
   c. Milwaukee Valve Company.
   
   d. NIBCO INC.
   
   e. United Brass Works, Inc.


5. End Connections: Threaded.

G. Iron OS&Y Gate Valves:

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

   a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   
   b. American Valve, Inc.
   
   c. Clow Valve Company; a division of McWane, Inc.
   
   d. Crane Co.; Crane Valve Group; Crane Valves.
   
   e. Crane Co.; Crane Valve Group; Jenkins Valves.
   
   f. Crane Co.; Crane Valve Group; Stockham Division.
   
   g. Hammond Valve.
   
   h. Milwaukee Valve Company.
i. Mueller Co.; Water Products Division.

j. NIBCO INC.

k. Shurjoint Piping Products.

l. Tyco Fire & Building Products LP.

m. United Brass Works, Inc.

n. Watts Water Technologies, Inc.


3. Pressure Rating: 250 psig minimum

4. Body Material: Cast or ductile iron.

5. End Connections: Flanged or grooved.

H. Indicating-Type Butterfly Valves:

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

a. Anvil International, Inc.

b. Fivalco Inc.

c. Global Safety Products, Inc.

d. Kennedy Valve; a division of McWane, Inc.

e. Milwaukee Valve Company.

f. NIBCO INC.

g. Shurjoint Piping Products.

h. Tyco Fire & Building Products LP.

i. Victaulic Company.

2. Standard: UL 1091.


4. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.

b. Body Material: Bronze.

c. End Connections: Threaded.

5. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.

b. Body Material: Cast or ductile iron.

c. End Connections: Flanged, grooved, or wafer.


I. NRS Gate Valves:

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

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.

b. American Valve, Inc.
c. Clow Valve Company; a division of McWane, Inc.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Kennedy Valve; a division of McWane, Inc.
f. Mueller Co.; Water Products Division.
g. NIBCO INC.
h. Tyco Fire & Building Products LP.

5. Stem: Nonrising.
6. End Connections: Flanged or grooved.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

2. Pressure Rating: 175 psig minimum.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fire Protection Products, Inc.
   b. United Brass Works, Inc.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Affiliated Distributors.
   b. Anvil International, Inc.
   c. Barnett.
   d. Conbraco Industries, Inc.; Apollo Valves.
   e. Fire-End & Croker Corporation.
   f. Fire Protection Products, Inc.
   g. Flowserve.
   h. FNW.
   i. Jomar International, Ltd.
   j. Kennedy Valve; a division of McWane, Inc.
   k. Kitz Corporation.
   l. Legend Valve.
   m. Metso Automation USA Inc.
   n. Milwaukee Valve Company.
   o. NIBCO INC.
   p. Potter Roemer.
q. Red-White Valve Corporation.
r. Southern Manufacturing Group.
s. Stewart, M. A. and Sons Ltd.
t. Tyco Fire & Building Products LP.
u. Victaulic Company.
v. Watts Water Technologies, Inc.

D. Globe Valves:

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

   a. Fire Protection Products, Inc.
   b. United Brass Works, Inc.

E. Plug Valves:

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

   a. Southern Manufacturing Group.

2.6 SPECIALTY VALVES

A. General Requirements:

2. Pressure Rating:

   a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Alarm Valves:

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

   a. AFAC Inc.
   c. Reliable Automatic Sprinkler Co., Inc.
   d. Tyco Fire & Building Products LP.
   e. Venus Fire Protection Ltd.
   f. Victaulic Company.
   g. Viking Corporation.
3. Design: For horizontal or vertical installation.
4. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

C. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AFAC Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.

4. Type: Automatic draining, ball check.
5. Size: NPS 3/4

2.7 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Anvil International, Inc.
   b. National Fittings, Inc.
   c. Shurjoint Piping Products.
   d. Tyco Fire & Building Products LP.
   e. Victaulic Company.

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

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AGF Manufacturing Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
d. Victaulic Company.

4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. Fire-End & Croker Corporation.
   c. Potter Roemer.

2. Standard: UL 199.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AGF Manufacturing Inc.
   b. Triple R Specialty.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. Viking Corporation.

4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. CECA, LLC.
b. Corcoran Piping System Co.
c. Merit Manufacturing; a division of Anvil International, Inc.

5. Size: Same as connected piping.
7. Inlet and Outlet: Threaded.

2.8 SPRINKLERS

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

1. AFAC Inc.
3. Reliable Automatic Sprinkler Co., Inc.
4. Tyco Fire & Building Products LP.
5. Venus Fire Protection Ltd.

B. General Requirements:


C. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6 or larger, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes: See Section 3.14, Sprinkler Schedule.

2.9 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

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

   a. ADT Security Services, Inc.
   b. McDonnell & Miller; ITT Industries.
C. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AFAC Inc.
   b. Barksdale, Inc.
   c. Detroit Switch, Inc.
   d. Potter Electric Signal Company.
   e. System Sensor; a Honeywell company.
   f. Tyco Fire & Building Products LP.
   g. United Electric Controls Co.
   h. Viking Corporation.

3. Type: Electrically supervised water-flow switch with retard feature.
5. Design Operation: Rising pressure signals water flow.

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fire-Lite Alarms, Inc.; a Honeywell company.
   b. Kennedy Valve; a division of McWane, Inc.
   c. Potter Electric Signal Company.
   d. System Sensor; a Honeywell company.

3. Type: Electrically supervised.
5. Design: Signals that controlled valve is in other than fully open position.
2.10 PRESSURE GAGES
   A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1. AMETEK; U.S. Gauge Division.
      2. Ashcroft, Inc.
      4. WIKA Instrument Corporation.
   B. Standard: UL 393.
   C. Dial Size: 3-1/2- to 4-1/2-inch diameter.
   D. Pressure Gage Range: 0 to 250 psig.
   E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
   F. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

2.11 ESCUTCHEONS
   A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
   B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated.
   C. Split-Casting Escutcheons: Polished chrome-plated.
   D. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

2.12 SLEEVES
   A. Cast-Iron Wall Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
   B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.

2.13 SLEEVE SEALS
   A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1. Advance Products & Systems, Inc.
      2. Calpico, Inc.
      3. Metraflex, Inc.
      4. Pipeline Seal and Insulator, Inc.
B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Plastic.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.14 GROUT

A. Standard: ASTM C 1107, Grade B, post hardening and volume adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink, and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in “Quality Assurance” Article.

B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping and sprinklers as indicated, as far as practical.

1. Deviations from approved working plans 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. Auxiliary drains are to be noted on shop drawings.

H. Install alarm devices in piping systems.

I. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

J. 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.

K. Fill sprinkler system piping with water.

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. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

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 water service. 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. 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.
I. 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.

J. 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 check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:
   1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels, unless noted otherwise. Location of sprinklers shall be as shown on design drawings unless alternate location approved by architect and engineer.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

3.6 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.
C. Escutcheons for Existing Piping:
   2. Insulated Piping: Split plate, stamped steel with concealed hinge and spring clips.
   3. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split casting, cast brass with chrome-plated finish.
   4. Bare Piping at Ceiling Penetrations in Finished Spaces: Split casting, cast brass with chrome-plated finish.
   5. Bare Piping in Unfinished Service Spaces: Split casting, cast brass with polished chrome-plated finish.
   6. Bare Piping in Equipment Rooms: Split casting, cast brass.
   7. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting floor plate.

3.7 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. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

D. Install sleeves in new partitions, slabs, and walls as they are built.

E. 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."

F. 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."

G. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.

H. Seal space outside of sleeves in concrete slabs and walls with grout.

I. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

J. 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-pipe sleeves for pipes smaller than NPS 6
   b. Galvanized-steel-sheet sleeves for pipes NPS 6 and larger.
   c. Exception: Sleeves are not required for water-supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Concrete Roof Slabs: Galvanized-steel pipe.

5. 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.

6. 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.

K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.8 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.

3.9 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.

3.10 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.
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.

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

3.12 DEMONSTRATION
A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.13 PIPING SCHEDULE
A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
B. Standard-pressure, wet-pipe sprinkler system, NPS 2 inch and smaller, shall be the following:
   1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
C. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 inch and larger, shall be one of the following:
   1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
   2. Schedule 10, 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: Concealed sprinklers.
   4. Spaces Subject to Freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated.
   5. Special Applications: quick-response sprinklers where indicated.
B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate (unless other cover plate finish is indicated on plans)
2. Upright Pendent and Sidewall Sprinklers: White vinyl 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.

END OF SECTION 211313