SECTION 211000 - WATER-BASED FIRE-SUPPRESSION 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.

1.2 SUMMARY

A. This Section includes the following fire-suppression piping inside the building:

1. Automatic wet-type, Class [**I**] standpipe systems.
2. Automatic dry-type, Class [**I**] standpipe systems.
3. Wet-pipe sprinkler systems.
4. Dry-pipe sprinkler systems.

B. Related Sections include the following:

1. Division 10 Section "Fire Extinguisher Cabinets" and "Fire Extinguishers" for cabinets and fire extinguishers.
2. Division 21 Section "[**Electric-Drive, Centrifugal Fire Pumps**] [**Diesel-Drive, Centrifugal Fire Pumps**] [**Electric-Drive, Vertical-Turbine Fire Pumps**] [**Diesel-Drive, Vertical-Turbine Fire Pumps**]" for fire pumps, pressure-maintenance pumps, and pump controllers.
3. Division 21 Section " [**Clean-Agent Fire Extinguishing Systems**]" for extinguishing systems.
4. Division 22 Section "Facility Water Distribution Piping" for piping outside the building.
5. Division 28 Section "Fire Detection and Alarm" for alarm devices not specified in this Section.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. Underground Service-Entrance Piping: Underground service piping below the building.

1.4 SYSTEM DESCRIPTIONS

A. Combined Standpipe and Sprinkler System: Fire-suppression system with both standpipe and sprinkler systems. Sprinkler system is supplied from standpipe system.

B. Automatic Wet-Type, Class I Standpipe System: Includes DN 65 (NPS 2-1/2) hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

C. Automatic Dry-Type, Class I Standpipe System: Includes DN 65 (NPS 2-1/2) hose connections. Has open water-supply valve and dry-pipe valve with standpipes containing compressed air. Opening fire-hose valve releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into standpipes.

D. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. 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.

E. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

1.5 PERFORMANCE REQUIREMENTS

A. Standard Piping System Component Working Pressure: Listed for at least 1200 kPa (175 psig).

B. Fire-suppression standpipe system design shall be approved by the NIH Division of the Fire Marshal.

1. Minimum residual pressure at each hose-connection outlet is the following:
   a. DN 65 (NPS 2-1/2) Hose Connections: [**690 kPa (100 psig)**] <**Insert other**>.

2. Unless otherwise indicated, the following is maximum residual pressure at required flow at each hose-connection outlet:
   a. DN 65 (NPS 2-1/2) Hose Connections: [**1200 kPa (175 psig)**] <**Insert other**>.
   b. DN 65 (NPS 2-1/2) Hose Connections: [**690 kPa (100 psig)**] <**Insert other**>.

3. Provide a separate standpipe calculation demonstrating the NFPA 14 required flow rates and required pressures can be obtained based on the water supply being a fire department pumper with a capacity of 94.64 L/s (1500 gpm) at 1724 kPa (250 psi).

C. Fire-suppression sprinkler system design shall be approved by the NIH Division of the Fire Marshal.

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:

   a. ALL Areas of ALL NIH Buildings Not Identified Below as Having Another Classification: **Ordinary Hazard, Group 1**.
   b. Laboratories: **Ordinary Hazard, Group 2**.
   c. Specifically Identified Office Buildings on the NIH Bethesda Campus as identified in the NIH Design Policy and Guidelines: **Light Hazard**.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Certain Office Buildings Identified in the NIH Design Policy and Guidelines Protected as Light-Hazard Occupancy: **6.3 mL/s 0ver 139 sq. m (0.10 gpm over 1500 sq. ft.)**.
b. Non-Laboratory Areas of ALL NIH Buildings Protected as Ordinary-Hazard, Group 1 Occupancy: **9.5 mL/s 0ver 139 sq. m (0.15 gpm over 1500 sq. ft.)**.
c. Laboratory Areas of ALL NIH Buildings Protected as Ordinary-Hazard, Group 2 Occupancy: **12.6 mL/s 0ver 139 sq. m (0.20 gpm over 1500 sq. ft.)**.
d. Special Occupancy Hazard: As determined by authorities having jurisdiction.
e. No design area reduction for the use of quick-response sprinklers is permitted.

4. Maximum Protection Area per Sprinkler:

a. Certain Office Buildings Identified in the NIH Design Policy and Guidelines Protected as Light-Hazard Occupancy **20.9 sq. m (225 sq. ft)**.
b. ALL Other Areas: **12.1 sq. m (130 sq. ft)**

5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:

a. Light-Hazard Occupancies: **6.3 L/s (100 gpm)**.
b. Ordinary-Hazard Occupancies: **15.75 L/s (250 gpm)**.

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

1.6 SUBMITTALS

A. Product Data: For the following:

1. Piping materials, including [**dielectric fittings and**] [**dielectric fittings, flexible connections, and**] [**flexible connections and**] sprinkler specialty fittings.
2. Pipe hangers and supports[**, including seismic restraints**].
3. Valves, including listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim.
4. Air compressors, including electrical data.
5. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
6. Hose connections, including size, type, and finish.
7. Hose stations, including size, type, and finish of hose connections; type and length of fire hoses; finish of fire hose couplings; type, material, and finish of nozzles; and finish of rack.
8. Fire department connections, including type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
9. Alarm devices, including electrical data.

B. Electrical Interface Shop Drawings: Diagram power, signal, and control wiring for air compressor.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by the NIH Division of the Fire Marshal [including hydraulic calculations].

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in [**NFPA 13**] [**NFPA 13 and NFPA 14**] [**NFPA 14**]. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

E. Welding certificates.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For [**standpipe**] [**standpipe and sprinkler**] [**sprinkler**] specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression 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 or NICET Level III or IV engineering technician.

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

C. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."
3. NFPA 14, "Installation of Standpipe, Private Hydrant, and Hose Systems."
4. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies in order to comply with NFPA 13 requirements regarding obstructions to sprinkler discharge. Sprinklers shall be a minimum of 457 mm (18 in.) from HVAC inlets and outlets.

1.9 EXTRA MATERIALS

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

1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, 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 on Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE AND FITTINGS

A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795,[**hot-dip galvanized where indicated and**] with factory- or field-formed threaded ends.
1. Malleable-Iron Threaded Fittings: ASME B16.3.
2. Gray-Iron Threaded Fittings: ASME B16.4.
3. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe[**hot-dip galvanized where indicated**]. Include ends matching joining method.
4. Steel Threaded Couplings: ASTM A 865[**hot-dip galvanized-steel pipe where indicated**].
    1) <**Insert manufacturer's name.**>

B. Plain-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795[**hot-dip galvanized-steel pipe where indicated**].

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
2. Steel Flanges and Flanged Fittings: ASME B16.5.

C. Grooved-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, [**hot-dip galvanized where indicated and**] with [**factory- or field-formed, square-cut**] [**factory- or field-formed, square-cut- or roll**] [**factory- or field-formed, roll**]-grooved ends.

1. Grooved-Joint Piping Systems:

    a. [**Available**]Manufacturers:

        1) Anvil International, Inc.

2) Central Sprinkler Corp.
3) Ductilic, Inc.
4) JDH Pacific, Inc.
5) National Fittings, Inc.
6) Shurjoint Piping Products, Inc.
7) Southwestern Pipe, Inc.
8) Star Pipe Products; Star Fittings Div.
9) Victaulic Co. of America.
10) Ward Manufacturing.
11) <**Insert manufacturer's name.**>

b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.

c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves,[**prelubricated**] rubber gasket listed for use with housing, and steel bolts and nuts.

2.3 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: [**ASTM B 88, Type K (ASTM B 88M, Type A)**] [**ASTM B 88, Type K (ASTM B 88M, Type A) or ASTM B 88, Type L (ASTM B 88M, Type B)**] [**ASTM B 88, Type L (ASTM B 88M, Type B)**], water tube, annealed temper; with plain ends.

1. Copper fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
2. Brazing Filler Metals: AWS A5.8, BCuP-3 or BCuP-4.

B. Plain-End, Hard Copper Tube: [**ASTM B 88, Type K (ASTM B 88M, Type A)**] [**ASTM B 88, Type K (ASTM B 88M, Type A) or ASTM B 88, Type L (ASTM B 88M, Type B)**] [**ASTM B 88, Type L (ASTM B 88M, Type B)**], water tube, drawn temper.

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match tubing system.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket metal-to-metal seating surfaces, and solder-joint or threaded ends.
4. Copper, Mechanically Formed Tee Option: For forming T-branch on copper water tube.

   a. [**Available**]Manufacturers:

      1) T-Drill Industries, Inc.
      2) <**Insert manufacturer's name.**>

5. Brazing Filler Metals: AWS A5.8, BCuP-3 or BCuP-4.

C. Grooved-End, Hard Copper Tube: [**ASTM B 88, Type K (ASTM B 88M, Type A)**] [**ASTM B 88, Type K (ASTM B 88M, Type A) or ASTM B 88, Type L (ASTM B 88M,**

Type B)] [**ASTM B 88, Type L (ASTM B 88M, Type B)**], water tube, drawn temper; with factory- or field-formed, roll-grooved ends.

1. Copper, Mechanically Formed Tee Option: For forming T-branch on copper water tube.

   a. [**Available**]Manufacturers:

      1) T-Drill Industries, Inc.
      2) <**Insert manufacturer's name.**>

2. Grooved-Joint Systems:

   a. [**Available**]Manufacturers:

      1) Anvil International, Inc.
      2) Victaulic Co. of America.
      3) <**Insert manufacturer's name.**>

   b. Grooved-End Copper Fittings: ASTM B 75 (ASTM B 75M), copper tube or ASTM B 584, bronze casting. Fittings may have ends factory or field expanded to steel-pipe OD if required for copper tube systems using grooved-end-pipe couplings.
   c. Grooved-End-Tube Couplings: UL 213, rigid pattern, unless otherwise indicated; gasketed fitting equivalent to AWWA C606, but made to match copper-tube OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves,[**prelubricated**] rubber gasket listed for use with housing, and steel bolts and nuts. Use grooved-end-pipe couplings for tube and fitting that have expanded ends.

2.4 DIELECTRIC FITTINGS

A. Assembly shall be copper alloy, ferrous, and insulating materials with ends matching piping system.

B. Dielectric Unions: Factory-fabricated assembly, designed for 1724 kPa (250 psi) minimum working pressure at 82 deg C (180 deg F). Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.

1. [**Available**]Manufacturers:

   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Epco Sales, Inc.
   d. Hart Industries International, Inc.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Industries, Inc.; Wilkins Div.
   g. <**Insert manufacturer's name.**>

C. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 1200-kPa (175-psi) minimum working-pressure rating as required for piping system.

1. [**Available**]Manufacturers:

    a. Capitol Manufacturing Co.
    b. Central Plastics Company.
    c. Epco Sales, Inc.
    d. Watts Industries, Inc.; Water Products Div.
    e. <**Insert manufacturer's name.**>

D. Dielectric Flange Insulation Kits: Components for field assembly shall include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.

1. [**Available**]Manufacturers:

    a. Advance Products and Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.
    e. <**Insert manufacturer's name.**>

E. Dielectric Couplings: Galvanized steel with inert and noncorrosive thermoplastic lining and threaded ends and 2070 kPa (300 psi) working-pressure rating at 107 deg C (225 deg F).

1. [**Available**]Manufacturers:

    a. Calpico, Inc.
    b. Lochinvar Corp.
    c. <**Insert manufacturer's name.**>

F. Dielectric Nipples: Electroplated steel with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 2070 kPa (300 psi) working-pressure rating at 107 deg C (225 deg F).

1. [**Available**]Manufacturers:

    a. Perfection Corporation.
    b. Precision Plumbing Products, Inc.
    c. Victaulic Co. of America.
    d. <**Insert manufacturer's name.**>

2.5 SPRINKLER SPECIALTY FITTINGS

A. Sprinkler specialty fittings shall be UL listed or FMG approved, with 1200 kPa (175 psi) minimum working-pressure rating, and made of materials compatible with piping. NIH specifically prohibits the use of plain-end fittings with mechanical couplings and fittings that use steel gripping devices to bite into the pipe when pressure is applied.

B. Outlet Specialty Fittings:

1. [**Available**]Manufacturers:

    a. Anvil International, Inc.

b. Central Sprinkler Corp.
c. Ductilic, Inc.
d. JDH Pacific, Inc.
e. National Fittings, Inc.
f. Shurjoint Piping Products, Inc.
g. Southwestern Pipe, Inc.
h. Star Pipe Products; Star Fittings Div.
i. Victaulic Co. of America.
j. Ward Manufacturing.
k. <**Insert manufacturer's name.**>

2. Mechanical-T and -Cross Fittings: UL 213, ductile-iron housing with gaskets, bolts and nuts, and threaded, or grooved outlets.

C. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.

1. [**Available**]Manufacturers:

a. Central Sprinkler Corp.
b. Fire-End and Croker Corp.
c. Viking Corp.
d. Victaulic Co. of America.
e. <**Insert manufacturer's name.**>

D. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.

1. [**Available**]Manufacturers:

a. Elkhart Brass Mfg. Co., Inc.
b. Fire-End and Croker Corp.
c. Potter-Roemer; Fire-Protection Div.
d. <**Insert manufacturer's name.**>

E. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.

1. [**Available**]Manufacturers:

a. AGF Manufacturing Co.
b. Central Sprinkler Corp.
c. G/J Innovations, Inc.
d. Triple R Specialty of Ajax, Inc.
e. <**Insert manufacturer's name.**>

F. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.

1. [**Available**]Manufacturers:

a. CECA, LLC.
b. Merit.
c. <**Insert manufacturer's name.**>

G. Dry-Pipe-System Fittings: UL listed for dry-pipe service.

2.6 LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed or FMG approved, with 1200 kPa (175 psi) minimum pressure rating. Valves shall have [**1725 kPa (250 psi) minimum**] [**2070 kPa (300 psi)**] pressure rating if valves are components of high-pressure piping system.

B. Gate Valves with Wall Indicator Posts:

1. Gate Valves: UL 262, cast-iron body, bronze mounted, with solid disc, nonrising stem, operating nut, and flanged ends.
2. Indicator Posts: UL 789, horizontal-wall type, cast-iron body, with [**operating wrench**] [**hand wheel**], extension rod, locking device, and cast-iron barrel.
3. [**Available**]Manufacturers:

a. Grinnell Fire Protection.
b. McWane, Inc.; Kennedy Valve Div.
c. NIBCO.
d. Stockham.
e. <**Insert manufacturer's name.**>

C. Ball Valves: Comply with UL 1091, except with ball instead of disc.

1. DN 40 (NPS 1-1/2) and Smaller: Bronze body with threaded ends.
2. DN 50 and DN 65 (NPS 2 and 2-1/2): Bronze body with threaded ends or ductile-iron body with grooved ends.
3. DN 80 (NPS 3): Ductile-iron body with grooved ends.
4. [**Available**]Manufacturers:

a. NIBCO.
b. Victaulic Co. of America.
c. <**Insert manufacturer's name.**>

D. Butterfly Valves: UL 1091.

1. DN 50 (NPS 2) and Smaller: Bronze body with threaded ends.

a. [**Available**]Manufacturers:

1) Global Safety Products, Inc.
2) Milwaukee Valve Company.
3) <**Insert manufacturer's name.**>

2. DN 65 (NPS 2-1/2) and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends.

a. [**Available**]Manufacturers:

1) Central Sprinkler Corp.
2) Global Safety Products, Inc.
3) McWane, Inc.; Kennedy Valve Div.
4) Mueller Company.
5) NIBCO.
6) Pratt, Henry Company.
7) Victaulic Co. of America.
8) <**Insert manufacturer's name.**>

E. Check Valves DN 50 (NPS 2) and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.

1. [**Available**]Manufacturers:

a. AFAC Inc.
b. American Cast Iron Pipe Co.; Waterous Co.
c. Central Sprinkler Corp.
d. Clow Valve Co.
e. Crane Co.; Crane Valve Group; Crane Valves.
f. Crane Co.; Crane Valve Group; Jenkins Valves.
g. Firematic Sprinkler Devices, Inc.
h. Globe Fire Sprinkler Corporation.
i. Grinnell Fire Protection.
j. Hammond Valve.
k. Matco-Norca, Inc.
l. McWane, Inc.; Kennedy Valve Div.
m. Mueller Company.
n. NIBCO.
o. Potter-Roemer; Fire Protection Div.
p. Reliable Automatic Sprinkler Co., Inc.
q. Star Sprinkler Inc.
r. Stockham.
s. United Brass Works, Inc.
t. Venus Fire Protection, Ltd.
u. Victaulic Co. of America.
v. Watts Industries, Inc.; Water Products Div.
w. <**Insert manufacturer's name.**>

F. Gate Valves: UL 262, OS&Y type.

1. DN 50 (NPS 2) and Smaller: Bronze body with threaded ends.

a. [**Available**]Manufacturers:

1) Crane Co.; Crane Valve Group; Crane Valves.
2) Hammond Valve.
3) NIBCO.
4) United Brass Works, Inc.
5) <**Insert manufacturer's name.**>

2. DN 65 (NPS 2-1/2) and Larger: Cast-iron body with flanged ends.

a. [**Available**]Manufacturers:

1) Clow Valve Co.
2) Crane Co.; Crane Valve Group; Crane Valves.
3) Crane Co.; Crane Valve Group; Jenkins Valves.
4) Hammond Valve.
5) Milwaukee Valve Company.
6) Mueller Company.
7) NIBCO.
8) Red-White Valve Corp.
9) United Brass Works, Inc.
10) <**Insert manufacturer's name.**>

G. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.

1. Indicator: [**Electrical, 115-V ac, prewired, single-circuit, supervisory switch**] [**Electrical, 115-V ac, prewired, 2-circuit, supervisory switch**] [**Visual**].
2. DN 50 (NPS 2) and Smaller: Ball or butterfly valve with bronze body and threaded ends.

a. [**Available**]Manufacturers:

1) Milwaukee Valve Company.
2) NIBCO.
3) Victaulic Co. of America.
4) <**Insert manufacturer's name.**>

3. DN 65 (NPS 2-1/2) and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends.

a. [**Available**]Manufacturers:

1) Central Sprinkler Corp.
2) Grinnell Fire Protection.
3) McWane, Inc.; Kennedy Valve Div.
4) Milwaukee Valve Company.
5) NIBCO.
6) Victaulic Co. of America.
7) <**Insert manufacturer's name.**>

2.7 UNLISTED GENERAL-DUTY VALVES

A. Ball Valves DN 50 (NPS 2) and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig (4140-kPa) minimum CWP rating, blowout-proof stem, and threaded ends.

B. Check Valves DN 50 (NPS 2) and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

C. Gate Valves DN 50 (NPS 2) and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.

D. Globe Valves DN 50 (NPS 2) and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

2.8 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed or FMG approved, cast- or ductile-iron body with flanged or grooved ends, and 1200 kPa (175 psi) minimum pressure rating. Control valves shall have [**1725 kPa (250 psi) minimum**] [**2070 kPa (300 psi)**] pressure rating if valves are components of high-pressure piping system.

1. [**Available**]Manufacturers:

   a. AFAC Inc.
   b. Central Sprinkler Corp.
   c. Firematic Sprinkler Devices, Inc.
   d. Globe Fire Sprinkler Corporation.
   e. Grinnell Fire Protection.
   f. Reliable Automatic Sprinkler Co., Inc.
   g. Star Sprinkler Inc.
   h. Venus Fire Protection, Ltd.
   i. Victaulic Co. of America.
   j. Viking Corp.
   k. <**Insert manufacturer's name.**>

2. Dry-Pipe Valves: UL 260, differential type; with bronze seat with O-ring seals, single-hinge pin, and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

   a. Air-Pressure Maintenance Device: UL 260, automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 95- to 410-kPa (14- to 60-psi) adjustable range, and 1200 kPa (175 psi) maximum inlet pressure.

      1) [**Available**]Manufacturers:

         a) AFAC Inc.
         b) Central Sprinkler Corp.
         c) General Air Products, Inc.
         d) Globe Fire Sprinkler Corporation.
         e) Grinnell Fire Protection.
         f) Reliable Automatic Sprinkler Co., Inc.
         g) Star Sprinkler Inc.
         h) Viking Corp.
         i) <**Insert manufacturer's name.**>

b. Air Compressor: UL 753, fractional horsepower, 120-V ac, 60 Hz, single phase.

1) [**Available**]Manufacturers:

a) AFAC Inc.
b) Gast Manufacturing, Inc.
c) Grinnell Fire Protection.
d) Reliable Automatic Sprinkler Co., Inc.
e) Viking Corp.
f) <**Insert manufacturer's name.**>

B. Pressure-Regulating Valves: UL 1468, brass or bronze, [**DN 40 (NPS 1-1/2)**] [**NPS 1-1/2 and NPS 2-1/2 (DN 40 and DN 65)**] [**DN 65 (NPS 2-1/2)**], 2760-kPa (400-psi) minimum rating. Include female NPS inlet and outlet, adjustable setting feature, and straight or 90-degree-angle pattern design as indicated.

1. Finish: Rough [**metal**] [**chrome-plated**].
2. [**Available**]Manufacturers:

a. AFAC Inc.
b. Elkhart Brass Mfg. Co., Inc.
c. Fire-End and Croker Corp.
d. GMR International Equipment Corporation.
e. Grinnell Fire Protection.
f. Potter-Roemer; Fire Protection Div.
g. Zurn Industries, Inc.; Wilkins Div.
h. <**Insert manufacturer's name.**>

C. Automatic Drain Valves: UL 1726, DN 20 (NPS 3/4), ball-check device with threaded ends.

1. [**Available**]Manufacturers:

a. AFAC Inc.
b. Grinnell Fire Protection.
c. <**Insert manufacturer's name.**>

2.9 SPRINKLERS

A. Basic Requirements

1. Sprinklers shall be UL listed or FMG approved, with 1200 kPa (175 psi) minimum pressure rating. Sprinklers shall have [**1725 kPa (250 psi) minimum**] [**2070 kPa (300 psi)**] pressure rating if sprinklers are components of high-pressure piping system.
2. Sprinkler temperature rating shall be between 68 and 80 °C (155 and 175 °F) for all NIH facilities/occupancies except for the following: (1) sprinklers designed for 93 °C (200 °F) shall be used in electric closets, and (2) high-temperature sprinklers rated at 141 °C (286 °F) with sprinkler head guards shall be used in autoclave areas, mechanical rooms, electrical rooms, electrical switchgear and transformer rooms, and any other areas in which high temperatures will routinely be experienced.

3. Quick-response sprinklers are to be used throughout all NIH facilities, but standard response sprinklers shall be used in autoclave areas, electrical switchgear rooms, transformer rooms, electrical closets, freezers, cold rooms, and mechanical rooms.

B. [**Available**]Manufacturers:

1. AFAC Inc.
2. Central Sprinkler Corp.
3. Firematic Sprinkler Devices, Inc.
4. Globe Fire Sprinkler Corporation.
5. Grinnell Fire Protection.
6. Reliable Automatic Sprinkler Co., Inc.
7. Star Sprinkler Inc.
8. Venus Fire Protection, Ltd.
9. Victaulic Co. of America.
10. Viking Corp.
11. <**Insert manufacturer's name.**>

C. Automatic Sprinklers: With heat-responsive element complying with the following:

1. UL 199, for nonresidential applications.
2. UL 1767, for early-suppression, fast-response applications.
   a. Sprinkler Types and Categories: Nominal 12.7-mm (1/2-in.) orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

D. Sprinkler types, features, and options as follows:

1. Concealed ceiling sprinklers, including cover plate.
2. Extended-coverage sprinklers.
3. Flush ceiling sprinklers, including escutcheon.
4. Institution sprinklers, made with a small, breakaway projection.
5. Pendent sprinklers.
6. Pendent, dry-type sprinklers.
7. Quick-response sprinklers.
8. Recessed sprinklers, including escutcheon.
9. Sidewall sprinklers.
10. Sidewall, dry-type sprinklers.
11. Upright sprinklers.
12. In areas with ceilings designed for water washdown, gasketed concealed sprinklers shall be provided. In areas that also have a pressure differential at the ceiling, which can affect the operation characteristics of the concealed sprinklers, the gasketed concealed sprinklers shall be specifically listed for use in ceilings with pressure differentials

E. Sprinkler Finishes: Chrome plated, bronze, and painted.

F. Special Coatings: Wax, lead, and corrosion-resistant paint.

G. 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. Ceiling Mounting: [**Chrome-plated steel, one piece, flat**] [**Chrome-plated steel, 2 piece, with 25 mm (1 in.) vertical adjustment**] [**Plastic, white finish, one piece, flat**].
2. Sidewall Mounting: [**Chrome-plated steel**] [**Plastic, white finish**], one piece, flat.

H. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler. Guards shall be specifically listed for the sprinkler on which they are being installed.

2.10 FIRE DEPARTMENT STANDPIPE HOSE OUTLETS

A. [**Available**]Manufacturers:

1. AFAC Inc.
2. Central Sprinkler Corp.
3. Elkhart Brass Mfg. Co., Inc.
4. Fire-End and Croker Corp.
5. Fire Protection Products, Inc.
6. GMR International Equipment Corporation.
7. Grinnell Fire Protection.
8. Guardian Fire Equipment Incorporated.
9. McWane, Inc.; Kennedy Valve Div.
10. Mueller Company.
11. Potter-Roemer; Fire-Protection Div.
12. United Brass Works, Inc.
13. <**Insert manufacturer's name.**>

B. Description: UL 668, brass or bronze, 2070 kPa (300 psi) minimum pressure rating, hose valve for connecting fire hose. Include [**angle**] [**angle or gate**] [**gate**] pattern design; female NPS inlet and male hose outlet; and lugged cap, gasket, and chain. Include DN 65 (NPS 2-1/2) hose valve threads according to NFPA 1963 and matching local fire department threads.

1. Valve Operation: [**Nonadjustable type**] [**Nonadjustable type, unless pressure-regulating type is indicated**] [**Pressure-regulating type**].
2. Finish: Rough [**metal**] [**metal or chrome-plated**] [**chrome-plated**].

2.11 HOSE STATIONS (fire department standpipe hose outlets installed in cabinets)

A. [**Available**]Manufacturers:

1. AFAC Inc.
2. American Fire Hose Cabinet Co.
3. Angus Fire, Inc.
4. Brooks Equipment Co., Inc.
5. Elkhart Brass Mfg. Co., Inc.
6. Fire-End and Croker Corp.
7. GMR International Equipment Corporation.
8. Potter-Roemer; Fire-Protection Div.
9. <**Insert manufacturer's name.**>

B. DN 65 (NPS 2-1/2) Hose Station: DN 65 (NPS 2-1/2) hose valve with male threaded outlet, cap, and chain.

1. Hose Valve and Trim Finish: [**Rough metal**] [**Rough chrome-plated**] [**Polished chrome-plated**].

2.12 FIRE DEPARTMENT (SIAMESE) CONNECTIONS

A. [**Available**]Manufacturers:

1. AFAC Inc.
2. Central Sprinkler Corp.
3. Elkhart Brass Mfg. Co., Inc.
4. Fire-End and Croker Corp.
5. Fire Protection Products, Inc.
6. GMR International Equipment Corporation.
7. Guardian Fire Equipment Incorporated.
8. Potter-Roemer; Fire-Protection Div.
9. Reliable Automatic Sprinkler Co., Inc.
10. United Brass Works, Inc.
11. <**Insert manufacturer's name.**>

B. Wall-Type, Fire Department Connection: UL 405, 1200 kPa (175 psi) minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to "AUTO SPKR & STANDPIPE."

1. Type: Flush, with [**two**] [**three**] [**four**] <**Insert other**> inlets and square or rectangular escutcheon plate.
2. Type: Exposed, projecting, with two inlets and round escutcheon plate.
3. Finish: [**Polished chrome-plated**] [**Rough chrome-plated**] [**Polished brass**].

C. Exposed, Freestanding-Type, Fire Department Connection: UL 405, [**1200 kPa (175 psi) minimum**] [**2070 kPa (300 psi)**] pressure rating; with corrosion-resistant-metal body, brass inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads. Include brass lugged caps, gaskets, and brass chains; brass lugged swivel connection and drop clapper for each hose-connection inlet; 460-mm (18-inch-) high, brass sleeve; and round, floor, brass escutcheon plate with marking "AUTO SPKR & STANDPIPE."

1. Finish Including Sleeve: [**Polished chrome-plated**] [**Rough chrome-plated**] [**Polished brass**].

2.13 ALARM DEVICES

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

B. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 1725 kPa (250 psi) pressure rating and designed for horizontal or vertical installation. Include 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.

1. [**Available**]Manufacturers:

a. ADT Security Services, Inc.
b. Grinnell Fire Protection.
c. ITT McDonnell & Miller.
d. Potter Electric Signal Company.
e. System Sensor.
f. Viking Corp.
g. Watts Industries, Inc.; Water Products Div.
h. <**Insert manufacturer's name.**>

C. Pressure Switch: UL 753, electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.

1. [**Available**]Manufacturers:

a. Grinnell Fire Protection.
b. Potter Electric Signal Company.
c. System Sensor.
d. Viking Corp.
e. <**Insert manufacturer's name.**>

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

1. [**Available**]Manufacturers:

a. McWane, Inc.; Kennedy Valve Div.
b. Potter Electric Signal Company.
c. System Sensor.
d. <**Insert manufacturer's name.**>

2.14 PRESSURE GAGES

A. [**Available**]Manufacturers:

1. AGF Manufacturing Co.
2. AMETEK, Inc.; U.S. Gauge.
3. Brecco Corporation.
4. Dresser Equipment Group; Instrument Div.
5. Marsh Bellofram.
6. WIKA Instrument Corporation.

7. <**Insert manufacturer's name.**>

B. Description: UL 393, 90- to 115-mm- (3-1/2- to 4-1/2-inch-) diameter, dial pressure gage with range of [**0 to 1725 kPa 0 (to 250 psi) minimum**] [**0 to 2070 kPa (0 to 300 psi)**].

1. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.
2. Air System Piping: Include[**retard feature and**] caption "AIR" or "AIR/WATER" on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and submit sprinkler shop drawings utilizing [NFPA 13 pipe schedule] [hydraulic calculations based on a static pressure of __ kPa (__ psi) and a residual pressure of __kPa (__ psi) with ___L/s (__ gpm) flow at [point of connection to existing underground main] [at zone control assembly]].

B. Sprinkler system material data and shop drawing(s), including hydraulic calculations (where applicable, shall be approved by the NIH Division of the Fire Marshal before materials are ordered and/or work begins.

C. A set of approved drawings shall be maintained at the work site.

3.2 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PIPING APPLICATIONS, GENERAL

A. Shop weld pipe joints where welded piping is indicated.

B. Do not use welded joints for galvanized-steel pipe.

C. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

D. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with [**threaded ends; cast- or malleable-iron threaded fittings; and threaded**] [**grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved**] joints.

E. Provide a central drain riser adjacent to the central system riser for all new systems. Pipe to an adequately sized sanitary drain.

F. Provide a main drain valve piped to an adequately sized sanitary drain for every riser in new multiple riser systems.

3.4 STANDPIPE SYSTEM PIPING APPLICATIONS

A. Standard-Pressure, Wet-Type Standpipe System, 1200 kPa (175 psi) Maximum Working Pressure:

1. DN 100 (NPS 4) and Smaller: Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
2. DN 100 (NPS 4) and Smaller: Plain-end, black, standard-weight steel pipe; steel welding fittings; and welded joints.
3. DN 100 (NPS 4) and Smaller: Grooved-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe with [**square-cut**] [**square-cut- or roll**] [**roll**]-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
4. DN 100 (NPS 4) and Smaller: Plain-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; wrought-copper fittings; and brazed joints.
5. DN 100 (NPS 4) and Smaller: Grooved-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; grooved-end copper fittings; grooved-end-tube couplings; and grooved joints.
6. DN 125 and 150 (NPS 5 and 6): Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
7. DN 125 and 150 (NPS 5 and 6): Plain-end, black, standard-weight steel pipe; steel welding fittings; and welded joints.
8. DN 125 and 150 (NPS 5 and 6): Grooved-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe with [**square-cut**] [**square-cut- or roll**] [**roll**]-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
9. DN 125 and 150 (NPS 5 and 6): Plain-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; wrought-copper fittings; and brazed joints.
10. DN 125 and 150 (NPS 5 and 6): Grooved-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; grooved-end copper fittings; grooved-end-tube couplings; and grooved joints.
11. DN 200 (NPS 8): Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
12. DN 200 (NPS 8): Plain-end, black, standard-weight steel pipe; steel welding fittings; and welded joints.
13. DN 200 (NPS 8): Grooved-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe with [**square-cut**] [**square-cut- or roll**] [**roll**]-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
14. DN 200 (NPS 8): Plain-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; wrought-copper fittings; and brazed joints.
15. DN 200 (NPS 8): Grooved-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; grooved-end copper fittings; grooved-end-tube couplings; and grooved joints.

16. DN 250 and DN 300 (NPS 10 and NPS 12): Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
17. DN 250 and DN 300 (NPS 10 and NPS 12): Plain-end, black, standard-weight steel pipe; steel welding fittings; and welded joints.
18. DN 250 and DN 300 (NPS 10 and NPS 12): Grooved-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe with [**square-cut**] [**square-cut- or roll**] [**roll**]-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Standard-Pressure, Dry-Type Standpipe System, 1200 kPa (175 psi) Maximum Working Pressure:

1. DN 100 (NPS 4) and Smaller: Threaded-end, galvanized, standard-weight steel pipe; galvanized, cast- or malleable-iron threaded fittings; and threaded joints.
2. DN 100 (NPS 4) and Smaller: Grooved-end, galvanized, standard-weight steel pipe with [**square-cut**] [**square-cut- or roll**] [**roll**]-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
3. DN 100 (NPS 4) and Smaller: Plain-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; wrought-copper fittings; and brazed joints.
4. DN 100 (NPS 4) and Smaller: Grooved-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube with factory- or field-grooved, roll-grooved ends; grooved-end copper fittings; grooved-end-tube couplings; and grooved joints.
5. DN 125 and 150 (NPS 5 and 6): Threaded-end, galvanized, standard-weight steel pipe; galvanized, cast- or malleable-iron threaded fittings; and threaded joints.
6. DN 125 and 150 (NPS 5 and 6): Grooved-end, galvanized, standard-weight steel pipe with [**square-cut**] [**square-cut- or roll**] [**roll**]-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
7. DN 125 and 150 (NPS 5 and 6): Plain-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; wrought-copper fittings; and brazed joints.
8. DN 125 and 150 (NPS 5 and 6): Grooved-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube with factory- or field-grooved, roll-grooved ends; grooved-end copper fittings; grooved-end-tube couplings; and grooved joints.

3.5 SPRINKLER SYSTEM PIPING APPLICATIONS

A. Standard-Pressure, Wet-Pipe Sprinkler System, 1200 kPa (175 psi) Maximum Working Pressure:

1. Sprinkler-Piping Fitting Option: Specialty sprinkler fittings, [**DN 50 (NPS 2)**] [**DN 65 (NPS 2-1/2)**] [**DN 80 (NPS 3)**] and smaller, including mechanical-T and -cross fittings, may be used downstream from sprinkler zone valves.
2. Copper-Tube Fitting Option: Copper, with brazed joints, may be used downstream from sprinkler zone valves where needed to avoid interference with medical equipment. Dielectric transitions shall be used as necessary. Comply with schedule tube and branch sizes listed in UL's "Fire Protection Equipment Directory."
3. DN 40 (NPS 1-1/2) and Smaller: Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.

4. DN 40 (NPS 1-1/2) and Smaller: Plain-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; locking-lug fittings; and twist-locked joints.
5. DN 40 (NPS 1-1/2) and Smaller: Plain-end, black, standard-weight steel pipe; steel welding fittings; and welded joints.
6. DN 40 (NPS 1-1/2) and Smaller: Plain-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; [**wrought-**]copper fittings; and brazed joints.
7. DN 50 (NPS 2): Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
8. DN 50 (NPS 2): Plain-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; locking-lug fittings; and twist-locked joints.
9. DN 50 (NPS 2): Plain-end, black, standard-weight steel pipe; steel welding fittings; and welded joints.
10. DN 50 (NPS 2): Grooved-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
11. DN 50 (NPS 2): Plain-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; [**wrought-**]copper fittings; and brazed joints.
12. DN 65 to DN 90 (NPS 2-1/2 to NPS 3-1/2): Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
13. DN 65 to DN 90 (NPS 2-1/2 to NPS 3-1/2): Plain-end, black, standard-weight steel pipe; steel welding fittings; and welded joints.
14. DN 65 to DN 90 (NPS 2-1/2 to NPS 3-1/2): Grooved-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
15. DN 65 and DN 80 (NPS 2-1/2 and NPS 3): Plain-end, [**Type K (Type A)**] [**Type L (Type B)**], hard copper tube; [**wrought-**]copper fittings; and brazed joints.
16. DN 100 to DN 150 (NPS 4 to NPS 6): Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
17. DN 100 to DN 150 (NPS 4 to NPS 6): Plain-end, black, standard-weight steel pipe; steel welding fittings; and welded joints.
18. DN 100 to DN 150 (NPS 4 to NPS 6): Grooved-end, [**black**] [**black or galvanized**] [**galvanized**], standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
19. DN 100 to DN 150 (NPS 4 to NPS 6): Threaded-end, [**black**] [**black or galvanized**] [**galvanized**], Schedule 30 steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.

B. Standard-Pressure, Dry-Pipe Sprinkler System, 1200 kPa (175 psi) Maximum Working Pressure:

1. Sprinkler-Piping Fitting Option: Specialty sprinkler fittings, [**DN 50 (NPS 2)**] [**DN 65 (NPS 2-1/2)**] [**DN 80 (NPS 3)**] and smaller, including mechanical-T and -cross fittings, may be used downstream from sprinkler zone valves.
2. DN 40 (NPS 1-1/2) and Smaller: Threaded-end, galvanized, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
3. DN 50 (NPS 2): Threaded-end, galvanized, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
4. DN 50 (NPS 2): Grooved-end, galvanized, standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

5. DN 65 to DN 90 (NPS 2-1/2 to NPS 3-1/2): Threaded-end, galvanized, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
6. DN 65 to DN 90 (NPS 2-1/2 to NPS 3-1/2): Grooved-end, galvanized, standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
7. DN 100 to DN 150 (NPS 4 to NPS 6): Threaded-end, galvanized, standard-weight steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
8. DN 100 to DN 150 (NPS 4 to NPS 6): Grooved-end, galvanized, standard-weight steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.6 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Listed Fire-Protection Valves: UL listed and FMG approved for applications where required by [**NFPA 13**] [**NFPA 13 and NFPA 14**] [**NFPA 14**].

   a. Shutoff Duty: Use ball, butterfly, or gate valves.

2. Unlisted General-Duty Valves: For applications where UL-listed and FMG-approved valves are not required by [**NFPA 13**] [**NFPA 13 and NFPA 14**] [**NFPA 14**].

   a. Shutoff Duty: Use ball, butterfly, or gate valves.
   b. Throttling Duty: Use ball or globe valves.

3.7 JOINT CONSTRUCTION

A. Refer to Division 21 Section "Common Work Results for Fire Suppression" for basic piping joint construction.

B. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads.

C. Mechanically Formed, Copper-Tube-Outlet Joints: Use UL-listed tool and procedure. Drill pilot hole in copper tube, form branch for collar, dimple tube to form seating stop, and braze branch tube into formed-collar outlet.

D. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.

1.
2. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.
3. Copper Tube: Roll-groove tubing. Use grooved-end fittings and grooved-end-tube couplings.
4. Dry-Pipe Systems: Use fittings and gaskets listed for dry-pipe service.

E. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.

1. DN 50 (NPS 2) and Smaller: Use dielectric unions, couplings, or nipples.
2. DN 65 to DN 100 (NPS 2-1/2 to NPS 4): Use dielectric flanges.

3. DN 125 (NPS 5) and Larger: Use dielectric flange insulation kits.

3.8 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression piping to water-service piping of size and in location indicated for service entrance to building. Refer to Division 22 Section "Facility Water Distribution Piping" for exterior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Refer to Division 22 Section "Facility Water Distribution Piping" for backflow preventers.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.9 WATER-SUPPLY CONNECTION

A. Connect fire-suppression piping to building's interior water distribution piping. Refer to Division 22 Section "Domestic Water Piping" for interior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.10 PIPING INSTALLATION

A. Refer to Division 21 Section "Common Work Results for Fire Suppression" for basic piping installation.

B. 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 Contracting Officer before deviating from approved working plans.

C. Install underground ductile-iron service-entrance piping according to NFPA 24 and with restrained joints.[**Encase piping in corrosion-protective encasement.**]

D. Install underground copper service-entrance piping according to NFPA 24.[**Encase piping in corrosion-protective encasement.**]

E. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

F. Install unions adjacent to each valve in pipes DN 50 (NPS 2) and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

G. Install flanges or flange adapters on valves, apparatus, and equipment having DN 65 (NPS 2-1/2) and larger connections.

H. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13. Remote point Inspectors Test shall be omitted where zone control assemblies are used in conjunction with a central drain riser.

I. Install sprinkler piping with drains for complete system drainage.

J. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes. Standpipe hose valves shall be at a 90 degree angle to the sprinkler system supply pipe where they share the same riser.

K. Install drain valves on standpipes. Drains valves shall be 2 in. in size and shall be piped to the exterior of the building or to a sanitary drain of adequate size to accept the full pressurized flow from the drain valve.

L. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

M. Install alarm devices in piping systems.

N. Hangers and Supports: Comply with NFPA 13 for hanger materials.

1. Install standpipe system piping according to NFPA 14.
2. Install sprinkler system piping according to NFPA 13.

O. Earthquake Protection: Install piping according to NFPA 13 to protect from earthquake damage.

P. 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 DN 8 (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.

Q. Drain dry-type standpipe piping.

R. Drain dry-pipe sprinkler piping.

S. Pressurize and check dry-pipe sprinkler system piping and [**air-pressure maintenance devices**] [**air compressors**].

T. Fill wet-standpipe system piping with water.

U. Fill wet-pipe sprinkler system piping with water.

V. Install flexible connectors on fire-pump[**and pressure-maintenance-pump**] supply and discharge connections[**and in fire-suppression piping where indicated**].

3.11 VALVE INSTALLATION

A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to [**NFPA 13**] [**NFPA 13 and NFPA 14**] [**NFPA 14**] 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 control valves a minimum of 1.8 m (5 ft -3 in.) and a maximum of 2.3 m (7 ft. – 5 in.) above the floor

D. Where valves are located above hard ceilings access shall be provided by a minimum of 0.46 m by 0.46 m (18 in. by 18 in.).

E. Install backflow preventers in all-water supply sources. Backflow preventers shall be of the reduced pressure loss type.

F. Specialty Valves:
1. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
    a. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with [**95- to 410-kPa (14- to 60-psig)**] <**Insert other**> adjustable range; and [**1200 kPa (175 psi)**] <**Insert other**> maximum inlet pressure.
    b. Install air compressor and compressed-air supply piping.
    c. Install compressed-air supply piping from building's compressed-air piping system.

3.12 SPRINKLER APPLICATIONS

A. Drawings indicate sprinkler types to be used. Where specific types are not indicated, use the following sprinkler types:

1. Rooms without Ceilings: [**Upright sprinklers**] <**Insert other**>.
2. Rooms with Suspended Ceilings: [**Pendent sprinklers**] [**Recessed sprinklers**] [**Flush sprinklers**] [**Concealed sprinklers**] [**Pendent, recessed, flush, and concealed sprinklers, as indicated**].
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: [**Upright sprinklers**] [**Pendent, dry sprinklers**] [**Sidewall, dry sprinklers**] [**Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated**] <**Insert other**>.
5. Deluge-Sprinkler Systems: [**Upright**] [**Upright and pendent**] [**Pendent**], open sprinklers.
6. Special Applications: [**Extended-coverage, and quick-response sprinklers where indicated**] <**Insert other**>.
7. Sprinkler Finishes:

a. Upright, Pendent, 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.
b. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
c. Flush Sprinklers: Bright chrome, with painted white escutcheon.
d. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
e. Residential Sprinklers: Dull chrome.

3.13 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of [**narrow dimension of**] acoustical ceiling panels and tiles.

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

C. Where pendent sprinklers are installed directly in branch line fittings (with no drop nipple) the fittings shall have 1 inch outlets and shall be provided with 25 mm (1 inch) by 12 mm (0.5 inch) hexagon reducing bushings to permit connection of 25 mm (1 inch) drop nipples in the future.

D. Install approved sprinkler guards on sprinklers in elevator machine rooms, obstruction sprinklers located below ducts or other obstructions, in other locations identified in NFPA 13 and in other locations noted on the drawings.

3.14 FIRE DEPARTMENT STANDPIPE HOSE OUTLET INSTALLATION

A. Install hose connections adjacent to standpipes, unless otherwise indicated.

B. Standpipe hose connections shall be installed between 0.91 m and 1.52 m (3 ft and 5 ft) AFF.

C. Install freestanding hose connections for access and minimum passage restriction.

D. Install DN 40 (NPS 1-1/2) hose-connection valves with flow-restricting device, unless otherwise indicated.

E. Install DN 65 (NPS 2-1/2) hose connections with threaded reducer adapter and flow-restricting device, unless otherwise indicated.

F. Install wall-mounting-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Refer to Division 10 Section "Fire Extinguisher Cabinets" for cabinets.

3.15 FIRE DEPARTMENT (SIAMESE) CONNECTION INSTALLATION

A. Install wall-type, fire department connections in vertical wall.

B. Install freestanding-type, fire department connections in level surface.

1. Install protective pipe bollards on [**two**] [**three**] <**Insert other arrangement**> sides of each fire department connection. Refer to Division 05 Section "Metal Fabrications" for pipe bollards.

C. Fire department siamese connections shall be installed between 457 mm and 914 mm (18 in. and 36 in.) above the finished grade.

D. Install ball drip valve at each check valve for fire department connection. Pipe ball drip to exterior.

3.16 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.

D. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

E. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

F. Connect excess-pressure pumps to the following piping and wiring:

1. Sprinkler system, hydraulically.
2. Pressure gages and controls, hydraulically.
3. Electrical power system.
4. Alarm device accessories for pump.
5. Fire alarm.

G. Connect compressed-air supply to dry-pipe sprinkler piping.

H. Connect air compressor to the following piping and wiring:

1. Pressure gages and controls.
2. Electrical power system.
3. Fire alarm devices, including low-pressure alarm.

I. Electrical Connections: Power wiring is specified in Division 26.

J. Connect alarm devices to fire alarm.

K. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

L. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

M. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.17 PAINTING, LABELING AND IDENTIFICATION

A. All concealed sprinkler piping and sprinkler piping in the stairwells, storage rooms, mechanical rooms, and utility rooms shall be painted red enamel. All other exposed sprinkler piping (outside the stairwells) shall be painted to match the existing ceiling, and red enamel bands 0.1 m wide shall be painted at 3.0 m intervals. In aesthetically sensitive areas, exposed sprinkler piping shall be painted to match the existing ceiling without red enamel bands. Valves, inspector test assemblies, low-point drains, and auxiliary drains shall be provided with red enamel bands.

B. Install labeling and pipe markers on equipment and piping according to requirements in [**NFPA 13**] [**NFPA 13 and NFPA 14**] [**NFPA 14**] .

3.18 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system 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. Energize circuits to electrical equipment and devices.
4. Start and run air compressors.
5. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
6. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
7. Coordinate with fire alarm tests. Operate as required.
8. Coordinate with fire-pump tests. Operate as required.
9. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Contracting Officer and authorities having jurisdiction.

3.19 CLEANING AND PROTECTION

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Protect sprinklers from damage until Substantial Completion.

3.20 DEMONSTRATION

A. Engage a factory-authorized service representative to train NIH's maintenance personnel to adjust, operate, and maintain specialty valves. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 211000