

## SECTION 15300 - FIRE PROTECTION

## PART 1 - GENERAL

## 1.1 DESCRIPTION OF WORK:

- A. This Section specifies automatic sprinkler systems for buildings and structures. Materials and equipment specified in this Section include:

Pipe, fittings, valves and specialties.

Sprinklers and accessories.

- B. Products furnished but not installed include sprinkler head cabinet with spare sprinkler heads. Furnish to the Owner's maintenance personnel.

- C. The work of this section includes engineering by the Contractor. The Contractor shall act as Engineer of record for all fire protection work.

EDIT NOTE: Use the following paragraph for remodels and expansion projects.

- D. [The fire protection system work is an extension of the existing fire protection system. Provide all modifications to the existing system as required to complete the new work. Provide hydraulic calculations and shop drawings where required by the extent of the work or by the authority having jurisdiction.](#)

## 1.2 DEFINITIONS:

- A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).
- B. Other definitions for fire protection systems are listed in NFPA Standards 13, 13R, 14, 20 and 24.
- C. Working plans as used in this Section means those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13 and 14 for obtaining approval of the authority having jurisdiction.

## 1.3 SYSTEM DESCRIPTION:

- A. Provide a complete fire sprinkler system for the entire building (including, but not limited to, electrical rooms, mechanical penthouses and accessible sections of air handling units,) except designated areas as shown on the drawings which will not require fire sprinkler coverage will be specifically noted with "No A/S"
- B. Fire protection system is a "wet-pipe" system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by fire.
- C. Fire protection system is a "dry-pipe" system employing automatic sprinklers attached to a piping system containing air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry-pipe valve. The water then flows into the piping system and out the opened sprinkler.

- D. Single Interlocked Preaction System: The single interlocked preaction system requires operation of the detection system to trip the deluge valve and fill the system with water. Water will then be discharged on the fire when the sprinklers fuse. If the sprinkler piping or sprinkler is broken, the valve will not open. If the detection system operates due to fire, damage, or malfunction, the valve will open but the water will be contained in the sprinkler piping. If the detection system does not operate, the valve will not open. Provide manual release as required by NFPA-13. Detection system and wiring to preaction or fire alarm panel by Division 16.
1. The Preaction System shall be a UL listed assembly.
- E. Double Interlocked Preaction System: The double interlocked preaction system utilizes a detector system and pressurized air in the sprinkler piping. This system utilizes the deluge valve and is so arranged that the valve will open only when both pressure reduced in the sprinkler piping and the detection system operates. If the detection system operates due to fire, damage, or malfunction, the valve will not open. If the sprinkler piping is damaged or sprinkler is broken or fused, the valve will not open. The operation of both a sprinkler and a detector (or release) is required before the valve will open allowing water to enter the system piping. The system shall be supervised. Provide manual release as required by NFPA-13. Detection system and wiring to preaction panel or fire alarm panel by Division 16.
- F. Fire protection system is a "deluge" system employing open sprinklers attached to a piping system connected to a water supply through a valve that is opened by the operation of a fire detection system installed in the same areas as the sprinklers. When this valve opens water flows into the piping system and discharges from all attached sprinklers.
- G. Fire protection system is a "Class III, Standpipe and Hose" system which is an arrangement of piping, valves, hose connections and allied equipment.
- H. Elevator Shafts and Machine Rooms: Sprinklers shall be installed in elevator machinery rooms, at the top of elevator shafts, and at the bottom of elevator shafts.
1. Sprinkler coverage shall be designed for Ordinary Hazard Group One. Sprinkler heads shall be high temperature classification (286 degrees F.).
  2. The sprinkler heads in the elevator machinery room shall be supplied from a separate, independent sprinkler branch line with a readily accessible indicating shut-off valve located outside of the shaft or machinery room.
  3. At least one smoke detector shall be located in the same area of each sprinkler head. Activation of any one of these detectors shall cause emergency recall (if equipped) of the elevator(s) and also put the building into alarm.
  4. In addition to smoke detectors, at least one thermal detector, with 190 degrees F. fixed temperature, shall be installed in the same area of each sprinkler head. The circuitry for the thermal detector(s) shall be separate from the circuitry for the smoke detector(s). When any thermal detector is activated, a shunt-trip circuit breaker shall automatically disconnect all electrical power to the elevator machinery room and the elevator machinery.
  5. Division 16 shall provide Fire Detection System (detectors, wiring, panel, etc.) for complete operation of the Fire Sprinkler System for the elevator shaft and machine room.

#### 1.4 PROJECT SEISMIC REQUIREMENTS:

- A. All fire protection systems shall be installed to meet NFPA and UBC Seismic Zone 1 requirements.

1. Where any conflicts arise the more stringent requirements shall be applicable.

#### 1.5 SUBMITTALS:

- A. Product data for each type sprinkler head, valve, piping and piping specialty, fire protection specialty, fire department connection and any equipment installed in accordance with the Contract Documents. Index per specification chapter and item number.
- B. Shop drawings prepared in accordance with NFPA 13 identified as "working plans," including detailed riser schematics indicating pipe sizes and lengths; and hydraulic calculations where applicable, which have been approved by the authority having jurisdiction. Do not proceed with the installation of the work until the Architect/Engineer review of shop drawings is received.
- C. Contractor shall stamp shop drawings indicating compliance with applicable codes and contract drawings. Contractor shall stamp drawing "Approved for Construction."
- D. If more than two submittals (either for shop drawings or for record drawings) are made by the contractor, the Owner reserves the right to charge the contractor for subsequent reviews by their consultants. Such extra fees shall be deducted from payments by the Owner to the contractor.
- E. Maintenance data for each type sprinkler head, valve, piping specialty, fire protection specialty, fire department connection and hose valve specified, for inclusion in operating and maintenance manual specified in Division 1 and Division-15 Section "Basic Mechanical Requirements."
- F. Welder's qualification certificate.
- G. Test reports and certificates including "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Materials and Test Certificate for Underground Piping" as described in NFPA 13.

DESIGN NOTE: NICET Technician is not recognized by Colorado PE Board as acceptable.

- H. Hydraulic calculations and drawings submitted to the Engineer shall be prepared under the direct supervision of and bear the signed stamp of a professional engineer registered in the [State of Colorado](#) and familiar with this type of installation and with previous similar experience (practicing in the Fire Protection field) certifying that the fire sprinkler system has been designed and hydraulically calculated in compliance with NFPA and governing codes.
- I. Fire sprinkler piping design drawings shall show all ductwork, air devices, lighting and electrical panels.
- J. Shop drawings and hydraulic calculations shall be stamped and signed by the local fire prevention authority prior to submitting shop drawings to the Architect/Engineer.

#### 1.6 HYDRAULIC DESIGN:

- A. The Fire Sprinkler System shall be hydraulically calculated by the Contractor. Pipe schedule method is acceptable only as allowed in NFPA 13 5-2.2.
  - B. The wet pipe fire sprinkler system for the building shall be hydraulically calculated to comply with NFPA-13 and the following criteria:
    - 1. Light hazard occupancy for areas unless noted otherwise.
    - 2. Ordinary hazard occupancy for the following:
      - a. [Where noted or shown on drawings.](#)
      - b. Commercial Kitchens
      - c. Library Stack Areas
    - 3. Hose allowance shall comply with NFPA-13.
  - C. The final fire protection system demand shall be a minimum of 10 PSI below the water supply curve.
  - D. Velocities in pipes shall be shown on hydraulic calculations. Velocities in overhead piping shall not exceed 32 feet per second. Velocities in underground piping shall not exceed 16 feet per second.
  - E. Allow 10 feet of loss for electric water flow switches and note on hydraulic calculations.
  - F. The Fire Protection Contractor shall provide as many sets of hydraulic calculations as necessary, performed and submitted to prove that the most remote and demanding areas are calculated.
  - G. Design information shall be permanently affixed to the main riser as described in NFPA Pamphlet 13.
  - H. Water flow data for bidding purposes only is:
    - [ ] psi static
    - [ ] psi residual with [ ] gpm flowing
  - I. The Fire Protection Contractor shall be responsible for water flow data from the appropriate water department. A copy of the water flow test data from the water department shall accompany the hydraulic calculations before hydraulically calculating equipment fire sprinkler system.
  - J. The pipe and valve sizes indicated on the drawings and details are minimum sizes to be used regardless of sizes allowed by hydraulic calculations.
- 1.7 QUALITY ASSURANCE:
- A. Installer Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by qualified installer. The term qualified means experienced in such work (experienced shall mean having a minimum of 5 previous projects similar in size and scope to this project), familiar with all precautions required, and has complied with all the requirements of the authority having jurisdiction. The contractor shall be licensed for the design and installation for the specific type of system in the jurisdiction where the work is to be performed and the State

of Colorado. Upon request, submit evidence of such qualifications to the Engineer. Refer to Division-1 Section: "Definitions and Standards" for definitions for "Installers."

- B. Qualifications for Welding Processes and Operators: Comply with the requirements of AWS D10.9, Specifications of Qualifications of Welding Procedures and Welders for Piping and Tubing, Level AR-3."
- C. Regulatory Requirements: Comply with the requirements of the following codes:
  - 1. NFPA 13 - Standard for the installation of Sprinkler System, including applicable seismic requirements.
  - 2. NFPA 13R - Standard for the Installation of Sprinkler Systems in residential occupancies up to four stories.
  - 3. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.
  - 4. NFPA 24 - Installation of Private Fire Service Mains and their applications.
  - 5. NFPA 1961 - Standard for Fire Hose.
  - 6. NFPA 1963 - Screw Threads and Gaskets for Fire Hose Connections.

EDIT NOTE: Verify with Owner insurance requirements to specify FM or IRI.
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- 7. UL [and FM](#) Compliance: All fire protection system materials and components shall be Underwriter's Laboratories [and Factory Mutual](#) listed as well as labeled for the application anticipated.
  - 8. National Electrical Code (NEC).
  - 9. Uniform Building Codes, including applicable seismic requirements.
  - 10. Requirements of the local Building Department and Fire Department.
- D. Reference and standards listed are minimum requirements. Where more stringent requirements are specified or noted on the drawings, this shall be applicable.
- 1.8 SEQUENCING AND SCHEDULING:
- A. Schedule rough-in installations with installations of other building components.
  - B. Minimum time frame for notice of inspections, tests and meetings is five (5) days and list the persons to be notified.
- 1.9 EXTRA STOCK:
- A. Heads: For each style and temperature range (and length for dry heads) required, furnish additional sprinkler heads per NFPA-13.
    - 1. Obtain receipt from Owner that extra stock has been received.
  - B. Wrenches: Furnish 2 spanner wrenches for each type and size of valve connection and fire hose coupling.

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND PRODUCTS:

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements.

Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire protection systems.

- B. All equipment used on this project shall be new and UL listed unless noted or specified otherwise.

2.2 MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide fire protection system products from one of the following:

1. Gate Valves:

- a. Nibco
- b. Kennedy Valve, Div. of ITT Grinnell Valve Co., Inc.
- c. Mueller
- d. Stockham
- e. Grinnell
- f. Milwaukee

2. Swing Check Valves:

- a. Central
- b. Mueller
- c. Kennedy Valve, Div. of ITT Grinnell Valve Co., Inc.
- d. Star Sprinkler Corp.
- e. Viking
- f. Victaulic
- g. Globe
- h. Potter Roemer

3. Butterfly and Ball Valves:

- a. Grinnell
- b. Mueller
- c. Victaulic
- d. Milwaukee
- e. Kennedy

4. Grooved Mechanical Couplings:

- a. Gruklok
- b. Victaulic Company of America
- c. Central Sprink, Inc.

5. Double Check Valve Assembly:

- a. Febco Model 850
- b. Watts Model 709
- c. Conbraco 40-100
- d. Ames Model 2000 (epoxy)

EDIT NOTE: When using reduced pressure backflow preventer, provide large floor sink. See code book and manufacturer's data for capacities.

6. Compact Double Check Assembly:
  - a. Febco Model 870/870V
7. Reduced Pressure Backflow Assembly:
  - a. Febco Model 860
  - b. Watts 909
  - c. Conbraco 40-200
  - d. Ames 4000 Rp (epoxy)
8. Compact Reduced Pressure Backflow Assembly:
  - a. Febco Model 880/880V
9. Fire Protection Specialty Valves
  - a. Reliable Automatic Sprinkler Co., Inc.
  - b. Star Sprinkler Corporation
  - c. Viking Corporation
  - d. Central
  - e. Globe
  - f. Grinnell/Gem
10. Fire Department Connection:
  - a. Croker
  - b. Potter-Roemer
  - c. Elkhart
  - d. Grinnell/Gem
11. Sprinkler Heads:
  - a. Automatic Sprinkler Corp. of America.
  - b. Central Sprinkler Corp.
  - c. ITT Grinnell
  - d. Reliable Automatic Sprinkler Co., Inc.
  - e. Star Sprinkler Corp.
  - f. Viking Corp.
  - g. Globe
12. Fire Protection Specialties:
  - a. Croker-Standard Div.,; Fire-End & Croker Corp.
  - b. Elkhart Brass Mfg. Co., Inc.
  - c. Grinnell Fire Protection Systems Co., Inc.
  - d. Grunau Sprinkler Mfgr. Co., Inc.
  - e. Potter Roemer, Inc.
13. Inspector's Test and Drain Module

- a. Victaulic
- b. A.G.F.
- c. Grinnell/Gem

### 2.3 BASIC IDENTIFICATION:

- A. General: Provide identification complying with Division-15 "Mechanical Identification", in accordance with the following listing:
  1. Fire Protection Piping: Pipe markers.
  2. Fire Protection Valves: Valve tags.
  3. Fire Protection Signs: Provide the following signs:
    - a. At each sprinkler valve, sign indicating what portion of system valve controls.
    - b. At each outside alarm device, sign indicating what authority to call if device is activated.
    - c. At door to each sprinkler control valves [or at ceiling access points](#), sign reading "FIRE CONTROL".
    - d. At each drain or test, sign indicating its purpose.
- B. Attach to the riser a metal sign indicating the name, address and telephone number of the fire protection contractor. Also indicate the date of installation.

### 2.4 BASIC PIPING SPECIALTIES:

- A. General: Provide piping specialties complying with Division-15 Basic Mechanical Materials and Methods section "Piping Specialties", in accordance with the following listing:
  1. Pipe escutcheons.
  2. Dielectric unions.
  3. Drip pans.
  4. Pipe sleeves.
  5. Sleeve seals.
  6. Fire Barrier Penetration Seals.

### 2.5 BASIC SUPPORTS AND ANCHORS:

- A. General: Provide supports and anchors complying with Division-15 "Supports and Anchors" in accordance with the following listing:
  1. Adjustable steel clevis hangers, adjustable steel band hangers, or adjustable band hangers, for horizontal-piping hangers and supports.
  2. Two-bolt riser clamps for vertical piping supports.
  3. Steel turnbuckles and malleable iron sockets for hanger- rod attachments.
  4. Concrete inserts, top-beam C-clamps, side beam or channel clamps or center beam clamps for building attachments.

5. Concrete inserts and other type hangers penetrating into or through structural members shall be submitted (by the Fire Protection Contractor) to and have the approval of the structural engineer contracted for this project.
6. Powder driven studs shall not be allowed.
7. Hangers (which are acceptable for project) and hanger spacing shall be in accordance with NFPA-13.

#### 2.6 PIPE & FITTINGS (UNDERGROUND):

- A. Underground pipe shall be ductile iron, thickness Class 52 unless specified otherwise by local authorities or ANSI/AWWA C150/A21.50-81; 350 psi pressure rating; tar coated outside, cement mortar lined inside in accordance with ANSI/AWWA C104/A21.4-80. Full lengths of pipe shall be utilized to the greatest extent possible.
- B. Fittings for ductile iron pipe shall be 250 psi pressure rating in accordance with ANSI/AWWA C110-77, tar coated outside and cement lined inside in accordance with ANSI/AWWA C104/A21.4-80.
- C. Joints shall be push-on or mechanical type as per ANSI/AWWA C111/A21.11-80.

#### 2.7 PIPE AND TUBING MATERIALS (INSIDE BUILDING):

- A. General: Refer to Part 3 Article "Pipe Applications" for identification of systems where the below specified pipe and fitting materials are used.
- B. Steel Pipe: ASTM A 53, A795 or A135, Schedule 40 or Schedule 10, U.S. manufacture, black steel pipe, plain ends.
- C. American Tube Company "Dyna-Thread-40" and "Dyna-Flow" and Allied Tube and Conduit Corporation "Super Flo" are acceptable to Schedule 40 pipe. Installation shall be per manufacturer's recommendations.
- D. Schedule 5 pipe shall not be allowed.
- E. The Corrosion Resistance Ratio of the pipe shall be 1.00 or greater. Documentation shall be presented with product submittal.
- F. Schedule 10 pipe shall only be allowed for pipe sizes 2-1/2 inches and larger.
- G. Provide galvanized, schedule 40, piping system for preaction system and drain risers.

#### 2.8 FITTINGS (INSIDE BUILDING):

- A. Cast-Iron Threaded fittings: ANSI B16.4, Class 125 standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- B. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 300, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1. Install steel pipe with threaded joints and fittings for 2 inches and smaller and where shown on drawings.
- C. Steel Fittings: ASTM A234, seamless or welded, for welded joints.

- D. Grooved Mechanical Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47 Grade 32510 malleable iron; or ASTM A53, Type F or Types E or S.
- E. Grooved Mechanical Couplings: Consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure roll-grooved pipe and fittings. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service.
- F. Grooved Mechanical Fittings and Couplings for the entire fire protection system shall be of the same manufacturer as submitted in shop drawing equipment review.
- G. Cast-Iron Threaded Flanges: ANSI B16.1, Class 250; raised ground face, bolt spot faced.
- H. Cast Bronze Flanges: ANSI B16.24, Class 300; raised ground face, bolt holes spot faced.
- I. Plain end, hooker type, or push-on fittings or couplings shall not be allowed.
- J. Bushings and reducing couplings shall not be allowed.
- K. UL listed and Factory Mutual approved segmentally welded fittings are acceptable. Friction loss and flow data shall accompany hydraulic calculations.

#### 2.9 JOINING MATERIALS:

- A. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.
- B. Gasket Materials: Thickness, materials and type suitable for fluid or gas to be handled, and design temperatures and pressures.

#### 2.10 GENERAL DUTY VALVES:

- A. Gate Valves - 2 Inch and Smaller: Body and bonnet of cast bronze, 175 pound cold water working pressure - non-shock, threaded ends, solid wedge, outside screw and yoke, rising stem, screw-in bonnet, and malleable iron handwheel. Valves shall be capable of being repacked under pressure, with valve wide open.
- B. Gate Valves - 2-1/2 Inch and Larger: Iron body; bronze mounted, 175 pound cold water working pressure - non-shock. Valves shall have solid taper wedge; outside screw and yoke, rising stem; flanged bonnet, with body and bonnet conforming to ASTM A 126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being repacked under pressure, with valve wide open.
- C. Butterfly Valves: 2-1/2inches to 12inches, grooved, ductile iron body and disc ASTM-536, disc EPDM coated, listed and approved minimum 175 psi service, actuator, self-contained supervisory switch, weatherproof approved for indoor or outdoor use.
- D. Ball Valves: 1-1/2inches and smaller shall be threaded, forged brass construction, with teflon seats and blow out proof stem. Ball shall be full port with chrome plated ball.
- E. Ball Valves: 2inches to 3inches shall be listed to 300 p.s.i. with optional internal tamper switch. Body shall be ductile iron with corrosion resistant coating. Ball shall be 316 stainless steel, standard port design.

- F. Swing Check Valves: MSS SP-71; Class 175, cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line.
- G. Double Check Valve Assembly: Double check valve assembly shall be UL listed for fire protection service and USC-CCCF approved. Installation arrangement shall be per manufacturer's recommendations.
- H. Provide reduced pressure backflow preventer where required by authority having jurisdiction and/or water department having jurisdiction. See Part 2 Products under this Section for acceptable manufacturers and model number.

#### 2.11 SPECIALTY VALVES:

- A. Dry-Pipe Valves: Differential type, 175 psig working pressure, and have cast iron, flanged inlet and outlet, bronze seat with "O" ring seals, single hinge pin and latch design. Provide trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment and fill line attachment.
- B. Air-Pressure Maintenance Device, Dry-Pipe Systems: An automatic device to maintain the correct air pressure in a dry-pipe system or deluge system. System shall have shut-off valves to permit servicing without shutting down the sprinkler system, bypass valve for quick system filling, pressure regulator or switch to maintain system pressure, strainer; pressure ratings 14 to 60 psig adjustable range, and 175 psig maximum inlet pressure. Electrical ratings shall match compressor ratings.
- C. Deluge Valves: Cast iron body, 175 psig working pressure, hydraulically operated, differential pressure type valve. Valves shall have flanged inlet and outlet and bronze seat with "O" ring seals. Provide trim sets for bypass, drain, electric sprinkler alarm switch, pressure gauges, drip cup assembly piped without valves separate from main drain line, fill line attachment with strainer and push rod chamber supply connection.
- D. Emergency Pull Box: Metal enclosure, labeled with "Manual Emergency Station" and operating instructions, complete with union, 1/2 inch pipe nipple and bronze ball valve. The enclosure cover shall be held closed by a breakable strut, which prevents accidental opening and must be replaced after each opening.
- E. Preaction Valves: Preaction systems shall have valves specifically listed for preaction service.
- F. Deluge/Preaction System Control Panel: Panels shall be single area, two area, or single area cross zoned type as indicated. Control panel shall consist of a NEMA 1 enclosure, and contains detector, alarm and solenoid valve circuitry for operation of deluge valves. Panels shall contain power supply, battery charger, standby batteries, field wiring terminal strip, electrically supervised solenoid valves and polarized fire alarm bell, lamp test facility, SPDT auxiliary alarm contacts and rectifier. Control panel shall be UL listed and FM approved when used with thermal detectors and Class A detector circuit wiring. Electrical characteristics shall be 120 volts AC, 60 Hz, with 24 volts DC Gel Cell batteries. Panel provided by Division 15. Wiring from Fire Alarm Panel and power to Control Panel by Division 16. Locate Control Panel along side Fire Alarm Panel.

#### 2.12 BASIC METERS AND GAUGES:

- A. General: Provide meters and gauges complying with Division- 15 "Meters and Gauges", in accordance with the following listing

1. Pressure gauges, 0-250 psi range.

#### 2.13 ALARM DEVICE AND FIRE PROTECTION SPECIALTIES:

- A. General: Provide fire protection specialties, UL-listed, in accordance with the listing. Provide sizes and types which mate and match piping and equipment connections.
- B. Water Flow Indicators: Vane type water flow detector, rated to 250 psig; designed for horizontal or vertical installation; have 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere 125 volts AC and 0.25 ampere 24 volts DC; complete with factory-set field-adjustable retard element to prevent false signals, tamper-proof cover which sends a signal when cover is removed, and with activation time retarding capability set at 30 seconds. The setting shall be verified through the inspectors test prior to final inspection.
- C. Supervisory Switches: Provide products recommended by manufacturer for use in service indicated. SPST, normally closed contacts, designed to signal valve in other than full open position.
- D. Pressure Switch: Indicating low pressure trouble in sprinkler system.
- E. Pressure switch: Indicating flow in sprinkler system.
- F. Low Air Pressure Horn: Provide low air pressure horn as indicated.

#### 2.14 AUTOMATIC SPRINKLERS:

- A. Sprinkler Heads: Fusible link or frangible bulb type, and style as indicated or required by the application. Unless otherwise indicated, provide heads with nominal 1/2 inch discharge orifice, for "ordinary" temperature range with a minimum temperature of 155 degrees F. Provide "intermediate" temperature heads in Electrical rooms, where required as noted in NFPA 13, and as required by the Authority having jurisdiction.
- B. Sprinkler Head Finishes: Provide heads with the following finishes:
  1. Upright, Pendent and Sidewall Styles: Factory brass, rough bronze finish for heads in unfinished spaces. Heads shall be stainless steel where installed exposed to acids, chemicals, or other corrosive fumes.
  2. Concealed Style: Rough brass, adjustable, with painted white cover plate in finished spaces. (GEM Models FR946 and F946 Clean Line Sprinklers are not acceptable.)
  3. Recessed Style: Bright chrome, with bright chrome escutcheon plate. GEM Models FR948 and F948 recessed sprinklers are not acceptable.
  4. See drawings for additional sprinkler type requirements.
- C. Sprinkler Head Cabinet and Wrench: Finished steel cabinet, suitable for wall mounting, with hinged cover and space for spare sprinkler heads plus sprinkler head wrench. Provide amounts of each style per NFPA-13. Locate head cabinet on shop drawing submittal.
- D. Plastic fire sprinkler escutcheons are not acceptable.

#### 2.15 FIRE HOSES AND RACKS:

EDIT NOTE: Use para. A for Class I standpipe systems, para. B for Class II standpipe systems, para. C for Class III standpipe systems in a fully sprinklered building, and both A and B for Class III standpipe systems in a non-sprinklered building or where required by the AHJ. Some may require 1-1/2inch valve outlet even if no hose is required; some may require both a 1-1/2inch and 2-1/2inch valve. Use pressure regulating valves only where system pressure exceeds 100 psig for 1-1/2inch valve or 175 psig for 2-1/2inch valve. Also see Denver Policy BO63.

- A. Hose Outlet Valves: 300 psig, 2-1/2 inch, rough chrome plated, [pressure regulating](#), brass angle valve with external threads having the local fire department standard thread, for the 2-1/2inch valve, as specified in NFPA 1963. Provide with cap and chain finished to match valve.

OR

- B. Hose Outlet Valves: 300 psig, 1-1/2 inch, rough chrome plated, [pressure regulating](#), brass angle valve with external threads having the local fire department standard thread, for the 1-1/2 inch valve, as specified in NFPA 1963. Provide with cap and chain finished to match valve.

OR

- C. Hose Outlet Valves: 300 psig, 2-1/2 inch, rough chrome plated, [pressure regulating](#), brass angle valve, with removable, 2-1/2 inch x 1-1/2 inch reducing lug pin and hose connector coupling. Valve and coupling shall have external threads having the local fire department standard thread, for the 2-1/2inch valve, as specified in NFPA 1963. Provide spanner wrench for removal of reducing coupling. Provide with cap and chain finished to match valve.

EDIT NOTE: Verify requirement for hose and rack. Most AHJ (including Denver) do not want building supplied hose. Also edit 2.16 appropriately.

- D. Fire Hoses: 100 foot long, 1-1/2 inch, lined linen hose with pin lug, chrome plated, quick disconnect coupling; and chrome plated brass fog nozzle spray pattern adjustable from shut-off directly to 50 degrees fog, through 90 degrees fog. Comply with the requirements of NFPA 1961.
- E. Hose Rack: Semiautomatic, steel rack, finished in red enamel, and holds hose in place with cadmium plated pins. Racks shall be secured to the outlet valve and a pivot for release of hose.

EDIT NOTE: Below is a cabinet for 1-1/2inch valve, 2-1/2inch valve, extinguisher and no hose. Edit as appropriate.

#### 2.16 HOSE, VALVE AND EXTINGUISHER CABINETS:

- A. General: Provide cabinets to house hose valves; [\[hoses\]](#) [\[and extinguishers\]](#) as indicated.
- B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.
- C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:

1. Recessed (FVC-1): Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.
  2. Surface-Mounted (FVC-2): Cabinet box (tub) fully exposed and mounted directly on wall.
- D. Provide fire valve cabinet of type indicated with [\[full glass panel\]](#) [\[solid panel\]](#) door.
- E. Provide standard equipment "Croker" Series 2750, or "Potter Roemer" Series 1880 valve and extinguisher cabinets.
- 2.17 ROOF MANIFOLD:
- A. Provide [2] [3] way cast brass angle body, male outlets. Provide with [\[2\]](#) [\[3\]](#) hose angle valves (2-1/2inch), cast brass body, female inlet x male outlet, caps and chains, 300 psig rated. Manifold and valves shall have rough brass finish.
- 2.18 FIRE DEPARTMENT CONNECTIONS:
- A. Wall Type Siamese Connections: Polished chrome cast brass, 2-way flush wall type, with wall escutcheon and having National standard threads, for the connections size indicated, as specified in NFPA 1963. Each inlet shall have a clapper valve, and cap and chain. Unit shall have wall escutcheon of cast brass, finish to match connections, with words "Standpipe - Fire Dept. Connection" or "Auto Spkr. - Fire Dept. Connection" or "Auto Spkr. and Standpipe - Fire Department Connection" in raised letters. Contractor shall verify threads with local fire department.
- B. Sidewalk Siamese Connection: Polished Chrome plated cast brass, angle body, two way, siamese connection. Connection sizes shall be 4 inch outlet and two 2-1/2 inch inlets, having NH standard threads, for the connection size indicated, as specified in NFPA 1963. Each inlet shall have a clapper valve, and cap and chain. Provide 18 inch high chrome plated brass sleeve and chrome plated brass sidewalk plate, with words "Standpipe - Fire Dept. Connection" or "Auto Spkr. - Fire Dept. Connection" or "Auto Spkr. and Standpipe - Fire Department Connection" in raised letters.
- C. Fire department connections including location shall meet the approval of the fire department having jurisdiction.
- 2.19 INSPECTOR'S TEST AND DRAIN ASSEMBLY:
- A. Provide an alarm test module of a manufacturer listed in paragraph 2.2.
- B. Comply with NFPA-14, Section 5-11, for draining and testing of wet standpipe system.
- C. Test and drain piping shall be routed to exterior. Location shall meet Owner's approval.

## PART 3 - EXECUTION

## 3.1 EXAMINATION:

- A. Examine rough-in for fire hose valves and cabinets to verify actual locations of piping connections prior to installing cabinets.
- B. Examine walls for suitable conditions where cabinets are to be installed.
- C. Do not proceed until unsatisfactory conditions have been corrected.

## 3.2 PIPE APPLICATIONS:

- A. Install Schedule 40 steel pipe with threaded joints and fittings for 2 inch and smaller.
- B. Install Schedule 40 steel pipe with roll-grooved ends and grooved mechanical coupling or with threaded joints and fittings.
- C. Acceptable alternates to Schedule 40 pipe shall be installed per manufacturer's recommendations.

## 3.3 PIPING INSTALLATIONS:

- A. Provide a minimum 5feet-0inches cover for all underground pipe installations. Install in accordance with AWWA C600.
- B. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. So far as practical, install piping as indicated. Drawings are diagrammatic in character and do not necessarily indicate every required offset, valve, fitting, etc.
  - 1. Deviations from approved "working plans" for sprinkler piping, require written approval of the authority having jurisdiction. Written approval shall be on file with the Engineer prior to deviating from the approved "working plans."
- C. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.
- D. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes. Welded outlet branch pipe fittings are acceptable.
- E. Install unions in pipe 2 inch and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.
- F. Install flanges or flange adapters on valves, apparatus, and equipment having 2-1/2 inch and larger connections.
- G. For welded pipe, all cutouts (coupons) shall be removed prior to installation.
- H. Hangers and Supports: Comply with the requirements of NFPA 13. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake in accordance with NFPA 13.

- I. Make connections between underground and above-ground piping using an approved transition piece strapped or fastened to prevent separation.
  - J. Install mechanical sleeve seal at pipe penetrations in basement and foundation walls. Refer to Division 15 Section "Basic Piping Materials and Methods."
  - K. All piping penetrating walls to structure shall be sleeved and sealed per specification Section 15055.
  - L. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.
  - M. Install pressure gauge on the riser or feed main at or near each test connection. Provide gauge with a connection not less than 1/4 inch and having a soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and where they will not be subject to freezing.
  - N. The fire line entry valves shall have monitoring electrical switches, the wiring from which shall be carried to the fire annunciating panel.
  - O. The fire protection contractor shall be responsible for the coordination of his installation with all other contractors. See Section 15010 for prioritized components.
  - P. Protect adjacent area where pipe cutting and threading takes place (e.g. floors, ceilings, walls, etc.).
  - Q. There shall be no fire sprinkler piping in electrical rooms (other than piping serving sprinklers directly in that room) or installed over any electrical panels.
  - R. Provide spring-loaded check valve at top of drain risers.
  - S. Install pressure gauges on city and system sides of fire entry valve assembly.
  - T. Install hangers straight and true and piping parallel to building lines.
- 3.4 PIPE JOINT CONSTRUCTION:
- A. Welded Joints: AWS D10.9, Level AR-3.
  - B. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:
    - 1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    - 2. Align threads at point of assembly.
    - 3. Apply appropriate tape or thread compound to the external pipe threads.
    - 4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
    - 5. Damaged Threads: Do not use pipe with threads which are corroded or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

- C. Flanged Joints: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.
- D. Mechanical Grooved Joints: Roll grooves on pipe ends dimensionally compatible with the couplings.
- E. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

### 3.5 VALVE INSTALLATIONS:

- A. General: Install fire protection specialty valves, fittings and specialties in accordance with the manufacturer's written instructions, NFPA 13 and the authority having jurisdiction.
- B. Gate Valves: Install electronically supervised-open indicating valves so located to control all sources of water supply except fire department and roof manifolds connections. Where there is more than one control valve, provide permanently marked identification signs indicating the portion of the system controlled by each valve. Refer to Division-15 Section "Mechanical Identification" for valve tags and signs.
- C. Valve at water main tap shall be underground gate valve with roadway box.
- D. Install approved check valve assembly [reduced pressure backflow preventer](#) in each water supply connection. Provide check valve and indicating valve (with tamper switch) on the discharge side of reduced pressure backflow preventers.
- E. Dry-Pipe Valves: Install in the vertical position, in proper direction of flow, in the main supply to the dry- pipe system. Install the basic trim set, priming chamber attachment and fill line attachment in accordance with the manufacturer's written instructions. During hydrostatic test of system piping at pressure in excess of 50 psi, position the clapper in latched wide open position or removed from valve, to prevent injury to the valve. Test valve for proper operation.
- F. Deluge Valves: Install in the vertical position, in proper direction of flow, in the main supply to the deluge system. Install the basic trim set in accordance with the manufacturer's written instructions. Connect system controls and test valve for proper operation.
- G. Hose Outlet Valves: Install 1-1/2 inch hose outlet valves at each standpipe outlet for hose connections for use by building occupants. Install 2-1/2 inch hose outlet valves at each standpipe outlet for hose connections for use by the fire department.

OR

- H. Hose Outlet Valves: Install 2-1/2 inch hose outlet valves with easily removable 2-1/2 to 1-1/2 inch reducing coupling at each standpipe outlet for hose connections.

### 3.6 SPRINKLER HEAD INSTALLATIONS:

- A. Any sprinkler heads with any paint on them shall be replaced. The sprinkler system shall then be hydrostatically tested again at the contractor's expense.
- B. Sprinkler heads shall be positioned so as to comply with NFPA-13 for any obstructions. This includes, but is not limited to, soffits, surface mounted lights and indirect lighting arrangements. The Fire Protection Contractor is responsible for identifying these obstructions and designing the system accordingly.

- C. Run piping concealed above heated furred ceilings and in joists to minimize obstructions. Expose only heads.
- D. Protect exposed sprinkler heads against mechanical injury with standard guards. Provide sprinkler head guards in all mechanical, electrical or storage rooms as well as exposed pendant heads which are installed less than 8feet-0inches A.F.F.
- E. Provide 1 inch diameter nipple and 1 inch x 1/2 inch reducing fitting for each upright head. (Excluding mechanical equipment rooms.)
- F. Provide heads in "pocketed" areas caused by exposed duct, piping or beams.
- G. Sprinkler head deflector distance from face of finished ceiling shall not exceed 4inches.
- H. Sprinkler heads shall be located in the center of all 2 foot x 2 foot ceiling tiles and quarter points, along the center line lengthwise of 2 foot x 4 foot ceiling tiles.
- I. Use proper tools to prevent damage during installations.
- J. Install sprinkler piping in a manner such that mechanical equipment, ceiling tiles or lights can be accessed and easily removed. The sprinkler piping shall be installed to provide a minimum of 6inches above the top of a finished ceiling.
- K. Minimum fire sprinkler head temperature rating for sprinklers in electrical rooms shall be 212 degrees F. Keep sprinklers as far from transformers and/or panels as spacing allows.

### 3.7 FIRE VALVE CABINET INSTALLATIONS:

- A. Install fire hose valve and extinguisher cabinets in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
  - 1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
  - 2. Securely fasten fire hose valve and cabinets to structure, square and plumb, to comply with manufacturer's instructions.
  - 3. Where exact location of surface-mounted cabinets is not indicated, locate as directed by Architect.
- B. Identify equipment in cabinet with lettering spelling "Fire Hose," "Fire Hose and Extinguisher," and "Fire Hose Valve and Extinguisher" applied to door by process indicated below. Provide lettering to comply with requirements indicated for letter style, color, size, spacing and location or, if not otherwise indicated, as selected by Architect from manufacturer's standard arrangements.

### 3.8 FIRE DEPARTMENT CONNECTION INSTALLATIONS:

- A. Install automatic drip valves at the check valve on the fire department connection to the mains. Route drain to exterior.
- B. Install mechanical sleeve seal at pipe penetration in outside walls.

### 3.9 ROOF MANIFOLD INSTALLATION:

- A. Install automatic drip valves between control valve and roof manifold outlets as to drain entire length of pipe. Route drain to Janitor's sink.
  - B. Install mechanical sleeve seal at pipe penetration thru roof. Seal penetration water tight.
- 3.10 TEMPORARY CONSTRUCTION STANDPIPE SYSTEMS:
- A. Temporary construction of standpipe risers shall be provided, along with hose, nozzles and valves as appropriate and as required by the Authority Having Jurisdiction. The risers shall continue up thru each floor as the floors are erected. Standpipes shall be supplied through a temporary Siamese inlet at grade located and sized as directed by the Authority Having Jurisdiction. Access to the temporary Siamese inlet connection shall be kept clear and accessible at all times. It shall be the responsibility of the Contractor to insure this temporary fire protection supply be available at all times. All valves shall be properly adjusted for the maximum pressure setting allowable.
  - B. The contractor shall be responsible for all design coordination and approval with the Authority Having Jurisdiction, construction and phasing of the temporary construction standpipe system.
- 3.11 FIRE HYDRANTS AND VALVE BOXES:
- A. Fire hydrant shall be of sufficient length to allow the centerline of the nozzles to be 18 inches above finished grade, with 6inches flanged or mechanical joint inlet connection, 5-1/4inch valve opening, 4inch pumper nozzle, and two 2-1/2inch male hose nozzles. The hose nozzles threading shall be same as [\[Owner's existing fire hydrants\]](#) [\[municipal fire hydrants\]](#). Operating nut shall be same as [\[Owner's existing fire hydrants\]](#) [\[municipal fire hydrants\]](#), with operating wrench, and shall be tested and listed by AWWA, UL and FM.
  - B. Valve box shall be adjustable sliding type of sufficient length to allow top to terminate flush with finishing grade, with round base and lid marked "Water" in integrally cast raised letters. Valve box shall be furnished with valve operating wrench of sufficient length to extend 3 feet above finished grade when engaged with valve.
  - C. Manufacturer and model number of fire hydrant shall have the approval of fire department having jurisdiction prior to being submitted to Architect/Engineer for review.
- 3.12 INSTALLATION OF BASIC IDENTIFICATION:
- A. General: Install mechanical identification in accordance with Division-15 Basic Mechanical Materials and Methods section "Mechanical Identification".
  - B. Install fire protection signs on piping in accordance with NFPA 13 and NFPA 14 requirements.
- 3.13 INSTALLATION OF METERS AND GAUGES:
- A. Install meters and gauges in accordance with Division-15 "Meters and Gauges".
- 3.14 FIELD QUALITY CONTROL:
- A. Flush, test and inspect sprinkler piping systems in accordance with NFPA 13, Standard for installation of sprinkler systems, Edition 1991 - Chapter 8.
  - B. The fire sprinkler system shall not be connected to underground piping until the fire service main is tested and approved.

- C. The Fire Protection Contractor shall conduct and bear the costs of all necessary tests of the fire protection work, furnish all labor, power and equipment. All piping shall be tested with water as required, the tests witnessed by the authority having jurisdiction.
- D. Dry and preaction systems shall be both hydrostatically and pneumatically tested. Pneumatic test shall be in accordance with NFPA-13.
- E. The fire protection piping shall be tested under a hydrostatic pressure of not less than 200 psig, for a duration of not less than 2 hours.
- F. Replace piping system components which do not pass the test procedures specified, and retest repaired portion of the system at Fire Protection Contractor's expense.
- G. All piping tests (pneumatic and hydrostatic) shall be conducted prior to the application of any painting materials. This will prevent hidden leaks and/or repainting of repaired/altered piping.

### 3.15 SYSTEM CERTIFICATION:

- A. The Contractor shall provide the Owner with written certification prior to final inspection, that all new equipment:
  - 1. Has been visually inspected and functionally tested as required by the Specifications.
  - 2. Is installed entirely in accordance with the manufacturer's recommendations within the limitations of the system's UL listings and NFPA criteria.
  - 3. Is in proper working order.

### 3.16 FINAL INSPECTION AND TESTING:

- A. The Contractor shall make arrangements with the Owner for final inspection and witnessing of the final acceptance tests. The Fire Protection Contractor, the Alarm System Contractor and the Owner will conduct the final inspection and witness the final acceptance test.
- B. All tests and inspections required by the referenced Codes and Standards, and the Owner shall be performed by the Contractor.
- C. The inspecting committee as referenced above will visit the job site to inspect the work and witness the final acceptance tests when they have been advised by the Contractor that the work is completed and ready for test. If the work is not complete or the test is unsatisfactory, the Contractor shall be responsible for the Consultant's extra time and expenses for re-inspection and witnessing the re-testing of the work. Such extra fees shall be deducted from payments by the Owner to the Contractor.
- D. After the system has been inspected and tested, a certificate, "Contractor's Material and Test Certificate Sprinkler System - Water Spray System," shall be provided by the contractor and shall be signed by him or his representative, the Owner's representative and by a representative of the fire department if appropriate. Sufficient copies shall be prepared to ensure the Engineer, Owner, all inspecting authorities and the contractor have a copy for their files. The Contractor shall prepare one (1) test report for each inspection performed whether successful or not.
- E. The signing of the certificate by the Owner's representative shall in no way prejudice any claim against the contractor for faulty material, poor workmanship, or failure to comply with inspecting authority's requirements or local ordinances.

- F. Contractor shall provide at least five (5) working days notice for all tests.
  - G. All sprinkler supervisory initiating devices shall be functionally tested to verify proper operation.
  - H. All supervisory functions of each initiating device shall be functionally tested.
  - I. Receipt of all alarm and trouble signals, initiated during the course of the testing, shall be verified at the fire alarm control panel.
- 3.17 WORK BY OTHERS:
- A. Wiring of all water flow switches and tamper switches on valves to central alarm panel are by Division 16.
- 3.18 OPERATION AND MAINTENANCE MANUAL:
- A. The Contractor shall provide the Owner with a loose-leaf manual containing:
    - 1. A detailed description of the systems.
    - 2. A detailed description of routine maintenance required or recommended or which would be provided under a maintenance contract including a maintenance schedule and detailed maintenance instructions for each type of device installed.
    - 3. One copy of NFPA-25.
    - 4. Manufacturers' data sheets and installation manuals/instructions for all equipment installed.
    - 5. A list of recommended spare parts.
    - 6. Service directory, listing the specific equipment items and where parts can be obtained, with name, address and telephone number.
    - 7. Full size sepias of the record drawings (stamped and signed per section 1.6).
    - 8. Hydraulic calculations (stamped and signed per section 1.6).
    - 9. Test certificates.
  - B. Refer to [Division 1 and](#) Section 15010 "OPERATING AND MAINTENANCE" for additional requirements.
  - C. Within 15 days of the completion of the work, six (6) copies of the manual shall be submitted for approval.
- 3.19 RECORD DRAWINGS:
- A. The Contractor shall provide and maintain on the site an up-to-date record set of approved shop drawing prints which shall be marked to show each and every change made to the sprinkler system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings approved by the Owner without written instruction from the Owner in each case. This set of drawings shall be used only as a record set.

- B. Upon completion of the work, the record set of prints shall be used to prepare complete, accurate final record drawings reflecting any and all changes and deviations made to the sprinkler system.
  - C. The Owner, at his option and at the Contractor's expense, may require revised hydraulic calculations depending on the extent and nature of field changes.
  - D. The Record Drawings and Hydraulic Calculations shall have the signed stamp of a professional engineer registered in the [State of Colorado](#) certifying the Record Drawings and the Hydraulic Calculations accurately represent the completed fire protection system.
  - E. Upon completion of the work, two sets of blueline record drawings shall be submitted to the Owner for review.
  - F. Upon review of the blueline record drawings, before final approval, one (1) set of reproducible mylar record drawings and four (4) additional sets of blue line record drawings shall be delivered to the Owner.
- 3.20 GUARANTEE PERIOD:
- A. Guarantee: The Contractor shall guarantee all materials and workmanship for a period of one year beginning with the date of final acceptance by the Owner. The Contractor shall be responsible during the design, installation, testing and guarantee periods for any damage caused by him (or his subcontractors) or by defects in his (or his subcontractors') work, materials, or equipment.
  - B. Emergency Service: During the installation and warranty period, the Contractor shall provide emergency repair service for the sprinkler system within four hours of a request by the Owner for such service. This service shall be provided on a 24 hour per day, seven days per week basis.
- 3.21 TRAINING:
- A. The Contractor shall conduct two (2) training sessions of four (4) hours each to familiarize the building personnel with the features, operation and maintenance of the sprinkler systems. Training sessions shall be scheduled by the Owner at a time mutually agreeable to the Contractor and the Owner.
- 3.22 WATER DAMAGE:
- A. The Fire Protection Contractor shall be responsible for any damage to the work of others, to building and property/ materials of others caused by leaks in automatic sprinkler equipment, unplugged or disconnected pipes or fittings, and shall pay for necessary replacement or repair of work or items so damaged during the installation, testing or guarantee periods of the automatic sprinkler work.

END OF SECTION 15300