

## SECTION 15300 – FIRE PROTECTION

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to this section.

#### 1.2 WORK INCLUDED

- A. Code compliance, research, design, coordination, and installation of a complete and functional hydraulically calculated sprinkler system and combined riser standpipe system and fire pump, that meets the approval, and is in accordance with the requirements of Factory Mutual (FM), NFPA 101- Life Safety Code, Owner Standards, NFPA Fire Protection Standards, Underwriters Laboratory (UL), local and state regulation, and these specifications.
- B. This is a performance specification. It requires performance of design work, preparation and submission of drawings, procurement of approvals, and provision of complete functional system of automatic sprinklers and/or standpipes. As a result, this section serves dual purpose of providing specifications and indicating design criteria for Contractor's use and guidance in designing systems and preparing sprinkler drawings for approval.
- C. Alarm system devices including alarm valves, flow switches/pressure switches, tamper switches and coordination with Section 16000.
- D. Shop drawings and calculations prepared and submitted in accordance with the requirements of the local fire department and the Owner's insurance underwriter.
- E. Permits and approvals of the fire protection system.
- F. Field acceptance testing and certification.
- G. Coordination drawings.
- H. Submittal drawings and working plans shall be prepared utilizing a computer generated system compatible with Owners' AutoCad Drawing System.
- I. Commissioning of systems.
- J. Fire service from a point 5'-0" outside building foundation wall.
- K. Hydrant flow test.

- L. Complete automatic wet sprinkler system.
- M. Automatic sprinkler heads.
- N. Sprinkler accessories.
- O. Inspectors test stations.
- P. Standpipes and drain risers.
- Q. Fire department connections.
- R. Fire department valves and cabinets.
- S. Complete fire pump system, associated devices and appurtenances.
- T. Fire pump test header.
- U. Backflow preventor.
- V. Fire pump and jockey pump controller.
- W. Fire pump test.
- X. Escutcheons.
- Y. Core drilling of holes up to and including 12" diameter.
- Z. Sleeves, inserts and hangers.
- AA. Staging and planking up to and including 8 feet in height.
- BB. Record drawings.
- CC. Operation and maintenance manuals.
- DD. Valve tags and charts.
- EE. Instructions.
- FF. Hoisting, rigging and setting of all pipe and equipment.
- GG. Fees, permit, royalties, guarantees.
- HH. Pressure gauges at the top of all standpipes.
- II. Piping and valves.

JJ. Furnishing of access panels.

### 1.3 RELATED SECTIONS

- A. Examine drawings and criteria sheets and other Sections of the Specifications including, but not limited to, the following for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section. Coordinate all work with that of all other trades affecting or affected by work in this section.
1. Section 15050 – Basic Mechanical Materials and Methods
  2. Section 15055 – Through-Penetration Firestop System
  3. Section 15060 – Hangers and Supports
  4. Section 15075 – Mechanical Identification
  5. Section 18000 – Commissioning

### 1.4 REFERENCES

- A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.
- B. Material standards shall be as specified or detailed hereinafter and as follows:
1. NFPA Standards Nos. 13, 14, 20, 24, 25, 45, 70, 72 and NFPA 101, Life Safety Code.
  2. Factory Mutual Data Sheets – 2-8N, 3-7N and 3-26.
  3. Underwriters' Laboratories.
  4. State Building Code
  5. State Fire Marshal
  6. Owner Standards

### 1.5 SUBMITTALS

- A. Refer to Section 15050 and General Conditions for additional requirements.
- B. Submittals – The following documents shall be provided:
1. Flow Test Data
  2. Complete Hydraulic Calculations and working plans in accordance with NFPA-13.
  3. Complete Stamped and Coordinated Shop Drawings
  4. Pipe and Fittings
  5. Valves
  6. Sprinkler heads
  7. Escutcheons
  8. Applicable Devices, Alarms and Specialties
  9. Hangers and seismic restraints

- 10. Fire Pump, Jockey Pump and Controller
- 11. Fire Department Connections

- C. Submittals data shall be in bound sets and be submitted at one time. Transmit to the Owner's Representative for review and approval.
- D. Do not proceed with any work without final approved submittal data bearing approval stamps, including the Owner's Representative and the local or State Fire Marshal.
- E. Be responsible for any delays caused by not following the above procedure and/or not completing the design portion of the work in a timely manner.

#### 1.6 DESIGN CRITERIA

- A. Combination standpipe/sprinkler systems and all components, piping, valves and head location, ratings, etc., shall be designed in accordance with NFPA 13, 14, 20, 24, State Building Code and Owner's Insurance Company and other applicable NFPA pamphlets governing the installation of underground fire mains, alarm valves, system drains, fire pump, etc. The Fire Protection Subcontractor shall submit his shop drawings to Local Fire Department and Building Department and Owner's Insurance Company for approval prior to submission to Architect for approval.
- B. The fire protection work is partially shown on the fire protection drawings. Sprinkler head locations are shown on the architectural reflected ceiling plans for the public areas. Each bidder for work under this Section of the specifications shall establish for himself, the exact quantity of heads required. Refer to Architectural reflected ceiling plans for preferred sprinkler head locations. Additional head shall be provided as part of this Contract, as required, to satisfy the code requirements for the hazard stated.
- C. Each Bidder shall refer to the fire protection drawings and architectural reflected ceiling plans for major fire protection system's components, piping, head locations and which areas are to have fire department valves, hose cabinets, etc.
- D. Provide a complete and operable fire suppression system in all areas that are a part of this Contract. Coordinate all sprinkler head locations with the architectural reflected ceiling plans.
- E. Hydraulic calculations shall be based on flow characteristics specified herein for bid purposes only. Actual flow test must be performed or data must be obtained and verified as acceptable by all Authorities Having Jurisdiction by The Fire Protection Subcontractor. The Fire Protection Subcontractor shall perform his own up-to-date flow test to Architect for his review; indication of test location, date, flow, residual and static pressure, etc., as outlined in NFPA #13 and #291. The Fire Protection Subcontractor shall coordinate the flow test of the Owner and Local Water Department and pay all costs and fees associated with flow test at no additional cost to the Owner. The fire pump size shall be verified prior to ordering or installation based on flow test by The Fire Protection Subcontractor.

- F. Sprinkler system design shall be based on the following information and in accordance with the Owner's Insurance Company requirements:
1. Sprinkler systems shall be provided throughout the building and shall be hydraulically calculated to provide densities as hereinafter specified with hose allowances as required.
  2. Offices, Lounges, Conference Rooms and other light hazard occupancy, 0.10 gallons per minute per square foot over the hydraulically most remote 1500 square feet with at 100 GPM hose allowance and a maximum sprinkler spacing of 168 square foot per head.
  3. Kitchen areas shall be designed for Ordinary Hazard (Group I) occupancy, 0.15 gallons per minute per square foot over the hydraulically most remote 2000 square feet, with a 250 GPM hose allowance and a maximum sprinkler spacing of 130 square foot per head.
  4. Mechanical Rooms shall be designed for Ordinary Hazard (Group II) occupancy, .20 gallons per minute per square foot over the hydraulically most remote 2000 square feet with a 500 GPM hose allowance and a maximum sprinkler spacing of 130 square foot per head.
  5. For dry pipe sprinkler systems, include an additional 30% of floor area over the wet system design criteria.
- G. Sprinkler systems are to be zoned by floor. Provide floor control valve with tamper switch and flow switch for each riser and for each zone. Provide additional zoning as shown on the drawings.
1. The sprinkler piping is to be looped between risers. Piping arrangements shall be complete with control valves, tamper switches, flow switches, check valves and inspector test assemblies with drains as required by NFPA-13.
- H. Inspector test valves assemblies are to be located at the remote end of each zone. Provide test assemblies with sight glasses and hard pipe express drains to hub drains.
- I. Elevator shafts and elevator machine rooms are to be sprinklered in accordance with NFPA-13. Sprinkler branch piping shall be provided with a shutoff valve and tamper switch. Mount sprinkler 18" above finished floor in elevator shaft.
- J. Flow Test Data
1. Test Date: February, 2006
  2. Agency: Portland Water District
  3. Static Pressure: 92 psi.
  4. Residual Pressure: 80 psi.
  5. Flow Rate: 7500 gpm.
  6. Location: Hydrant #397, St. John Street
  7. Elevation: feet.
- K. The hydraulic calculations shall include the hydraulically most remote area for systems supplied by more than one combination riser. Hydraulic calculations shall show the remote areas being supplied solely from the hydraulically most remote combination riser.

- L. Velocity shall not exceed 20 FPS.
- M. All calculations shall assume 10 psi deterioration in static and regional pressures in the hydrant flow test results.

#### 1.7 WORKING PLANS

- A. Prepare working plans according to the requirements of NFPA Standard 13 and 14. Working plans and hydraulic calculations shall be prepared by a NICET-certified Level III or IV automatic sprinkler system engineering technician and stamped by a Professional Engineer registered in Maine. Working plans shall be provided in addition to the requirements for coordination drawings. Coordination drawings will not be accepted in lieu of working plans.
- B. Deviation from the approved plans will require re-approval by the reviewing authorities.
- C. Submit working plans and hydraulic calculations to the Owner's Representative. Plans submitted without review stamps or hydraulic calculations will be returned without review. Hydraulic calculations submitted without working plans will be returned without review.
- D. Submittal drawings and working plans shall be prepared utilizing a computer generated system.

#### 1.8 QUALITY ASSURANCE

- A. Installer: Company specializing in performing work of the type specified in this Section, with documented experience.
- B. Manufacturer: Company specializing in manufacturing products specified in this Section, with document experience.
- C. Welders: Certify in accordance with ASME (BPV1X)

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE PRODUCTS

- A. Materials and equipment provided under this Section to make a complete installation shall be U.L. listed and/or FMG-approved and in compliance with NFPA Standards.

#### 2.2 PIPING, FITTINGS, AND JOINTS

- A. Piping shall meet applicable ANSI or ASTM standards requirements and shall have manufacturer's name and standard marked on each length. Joints shall meet applicable ANSI

and ASTM standards requirements. Where ANSI and ASTM standard does not exist, joints and fittings shall bear UL listing symbol.

- B. Underground fire protection service piping shall be ductile-iron thickness class 52, ANSI A21-51 with cement-mortar lining per ANSI A21.4. Fittings shall be ductile-iron 250 psi rating per ANSI A21.10 with cement-mortar lining per ANSI A21.4. Pipe Joints shall be push-on ANSI A21.11 with retainer glands and thrust blocks as required. All materials and installation shall conform to NFPA 24 as a minimum. Furnish and install (2) flexible Dresser Model 35 Couplings and retainer clamps on the incoming water service. Connect to cement lined ductile iron site water main at 10' from building wall.
- C. Piping for sprinkler systems and standpipe systems 2-1/2" in size and larger may be Schedule 10 black steel conforming to ASTM 135. Piping for sprinklers 2" and smaller in size shall be Schedule 40 black steel conforming to ASTM A53. Should any authority require, standpipe and/or sprinkler risers shall be schedule 40 regardless of size.
- D. Piping for use with hole-cut fittings shall have machine cut holes per manufacturer requirements at predetermined positions, on the centerline of the pipe, of a size to receive the housing locating collar. Hole cutting machine shall be supplied by the fitting manufacturer.
- E. Piping for use with grooved end fittings shall be roll grooved without metal removal or as per manufacture requirements.
- F. Flexible piping connections to sprinkler heads may be used for either suspended or sheetrock ceilings. All flexible piping systems shall be UL listed and FM approved and suitable for their intended use, similar to Flexhead Series 2000.
  - 1. All flexible piping connections shall include a fully welded (non mechanical fittings), braided, leak-tested sprinkler drop with a minimum internal corrugated hose diameter of 1"; and a one-piece multi-port ceiling bracket with removable attachment hub and self-securing integrated snap-on clip ends, for attachment to ceiling grid without the need for a screw fastener.
- G. Fittings for Grooved End Steel Pipe shall be cast of ductile iron conforming to ASTM A-536 or forged steel conforming to ASTM A-234 (A-106, Gr. B), with grooved or shouldered ends for direct connection into grooved piping systems with steel pipe and shall be UL listed and FMG approved, rated for a minimum 300 psi maximum working pressure (MWP) and shall be of one manufacture Victaulic, Gruvlok or Central.
- H. Branch outlet fittings shall be UL listed and FMG approved, and rated for 500 psi (MWP) on piping 3" and larger, and 300 psi (MWP) on piping under 3" in size and shall be of one manufacture Victaulic, Gruvlok or Central:
  - 1. Mechanical tee branch, hole-cut type connections, with locating collar engaging into hole, with standard pressure responsive gaskets and black nuts and bolts similar to Victaulic Style 920/920N or

2. Outlet couplings, construction as hereinafter specified for couplings, with outlets grooved or threaded outlet ends with standard pressure responsive gaskets and black bolts and nuts similar to Victaulic Style 72.
  3. No strap, snap and or one bolt outlet fittings will be permitted.
- I. Standard black cast iron screwed fittings shall be used on piping 2" and smaller and may be used on larger sizes.
  - J. All grooved couplings, fittings and mechanical tee branch fittings shall be Victaulic, Gruvlok or Central.
  - K. All pipe, fittings, valves, devices and associated appurtenances shall be rated for pressures that may be developed.
  - L. Bushings shall not be permitted where fittings of required sizes are manufactured. Care shall be taken in the design of this work to avoid piping arrangements that would require bushings.
  - M. Unless specified otherwise herein, all fittings shall be in accordance with NFPA standards and subject to approval by the Architect/Engineer. All fittings are to be UL listed and FMG approved.
  - N. All close and shoulder nipples shall be of corresponding materials as the pipe and shall be extra heavy pattern.
  - O. Pipe and fittings exposed to weather and piping between check valve and fire department pumper connection shall be galvanized.
  - P. Piping and fittings may be joined by mechanical grooved couplings. Grooved couplings shall be cast of ductile iron conforming to ASTM A-536 with bolts/nuts conforming to ASTM A-449. Standard gaskets to be used for systems under operating conditions within the range -30°F through +230°F for wet fire protection sprinkler service. Dry pipe system to be provided with "flush seal" type gaskets. All grooved couplings shall be 300 psi (CWP) as a minimum.
    1. Rigid Type Couplings: Housings cast with offsetting, angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9. Couplings that require the use of torque wrenches for proper installation are not permitted similar to Victaulic Style 005.
    2. Flexible Type Couplings: Use in locations where vibration attenuation and stress relief are required similar to Victaulic Style 75.
    3. Flange Adapters: Flat face, for direct connection to ANSI Class 125 or 150 flanged components similar to Victaulic Style 744.
  - Q. All piping for fire pump suction, fire department connections and test headers shall be Schedule 40 piping.
  - R. Dry sprinkler piping and fittings shall be galvanized steel.
  - S. Preaction sprinkler piping and fittings shall be galvanized steel.



- T. Sprinkler piping in areas subject to magnetic fields, i.e. MRI, NMR's, etc. shall be copper, ASTM B88 Type L. Hung from copper hangers.

### 2.3 VALVES

- A. All valves shall be UL listed and FMG approved similar to Mueller, Nibco or Victaulic. All valves that are installed as a part of this specification shall be provided with pressure ratings suitable for their intended service.
- B. Shut-off and/or control valves shall be:
  - 1. Outside screw and yoke valve. Cast iron body, bronze mounted, flanged or grooved ends, solid wedge, 2-1/2" in size and up. All bronze, solid wedge, threaded ends, 2" and under in size both to be electrically supervised, or
  - 2. Bronze supervised slow close butterfly valve, threaded ends, stainless steel disc and stem, built-in supervisory switch, slow-close operator, up to 2-1/2" in size, or
  - 3. Butterfly type indicating valves, grooved end, ductile iron body, elastomer encapsulated ductile iron disc with integral seating surface or bronze disc with rubber seat, gear operator, with built-in supervisory switch similar to Victaulic 705W. Wafer body style is not acceptable.
  - 4. All equipment must be installed with isolation valves for service shut-off. The shut-off valves shall be screwed, grooved or flanged. If screwed ends are provided, a union or a coupling between equipment and valve shall be provided.
- C. Check valves shall be:
  - 1. Iron body, bronze mounted swing check with flanged ends, 2-1/2" in size up to 8" size; or
  - 2. Iron body, spring actuated, wafer check, sizes 4" through 8"; or
  - 3. Grooved end, ductile iron body, spring activated, sizes 2-1/2" through 12" similar to Victaulic Series 717.
  - 4. All check valves up to 2" in size shall be all bronze with screwed ends.
- D. Trim Valves: (for use on inspectors test set ups, alarm check valves, dry pipe valves, etc.)
  - 1. Gate valves - all bronze, solid wedge, outside screw and yoke, rising stem, screwed ends.
  - 2. Ball valves - all bronze, 400 lb. WWP, screwed ends.
  - 3. Globe valves - all bronze, 200 lb. WWP, screwed ends.
  - 4. Check valves - all bronze swing check, rubber disc, 200 lb. WWP, screwed ends.
- E. Backflow Preventors
  - 1. Detector check valves shall be Febco, Watts or Conbraco, ductile iron body, bronze mounted, flanged end with electrically supervised OS&Y, resilient wedge gate valves, threaded bypass taps in the inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when full system flow is required. Meter shall be disc type, AWWA C700.

2. The Fire Protection Subcontractor shall submit, as required, to local authorities for approval of backflow prevention device and proposed installation. Furnish confirmation of approval to the Architect before installation. Before Owner's instruction commences, arrange testing of the backflow prevention device by certified personnel and furnish confirmation of testing to the Architect. Provide one spare parts kit and one each of any special tools required per backflow prevention device installed.

F. Valve Boxes

1. Cast iron, two piece, pioneer pattern, sliding type with a non-flanged top section and an outside shaft diameter of six inches. Middle and bottom section length as needed. Boxes shall have the word Water clearly cast on the cover.

G. Post Indicator Valves

1. Cast iron, two piece, pioneer pattern, sliding type with a non-flanged top section and an outside shaft diameter of six inches. Middle and bottom section length as needed. Kennedy 2945 or Mueller.

## 2.4 SPRINKLER HEADS

- A. All sprinkler heads shall be listed by U.L. and approved by FMG. All sprinklers shall be of single manufacturer. Heads shall be as manufactured by Reliable, Central, Viking, Star or Victaulic.
- B. Sprinkler heads shall be furnished and installed to conform with manufacturer's listing.
- C. All sprinklers shall be coordinated with a final reflected ceiling plan to arrive at a suitable pattern consistent with proper sprinkler protection.
- D. All sprinklers within 8'-0" of the floor in mechanical rooms shall have sprinkler guards, wire gage type.
- E. Sprinklers shall be located in center of tiles.
- F. Glass bulb type sprinklers shall not be installed in areas subject to freezing.
- G. Semi-recessed sprinklers head similar to Reliable F1 shall be provided for all ordinary hazard areas with ceilings and shall be chrome-plated with 1/2" orifice, 155°F rated, FMG approved.
- H. Upright sprinkler heads similar to Reliable F1 shall be provided in, unfinished areas such as mechanical rooms, without ceilings and shall be brass, 1/2" orifice, 155°F rated, FMG approved.

- I. Upright or pendent heads in finished areas, without ceilings shall be similar to Reliable F1, chrome plated. 1/2" orifice, 155°F rated, FM approved.
- J. High temperature dry sidewall heads at the top and bottom of all elevator shafts shall be 200°F rated, 1/2" orifice.
- K. Freezers shall be provided with dry type pendent sprinklers, chrome plated with 1/2" orifice 155°F rated.
- L. Quick response recessed heads shall be provided in light hazard occupancy areas similar to Reliable Model F1FR, 1/2" orifice rated at 155°F.
- M. Glazing requiring window protection shall be provided with pendent vertical sidewall or horizontal sidewall chrome plated heads similar to Central WS, 155°F rated, 1/2" orifice.
- N. High temperature heads rated at 200°F shall be provided at discharge side of all glasswashers, cage and rack washers and autoclaves. Heads shall be chrome plated pendent style similar to Reliable F1.
- O. Spare Heads: Provide 20-gauge steel sprinkler head cabinets with red enamel finish. Furnish the quantities of spare sprinkler heads for each type installed as required by NFPA Standard 13. Furnish sprinkler wrench for each head type installed. Mount in mechanical room or fire pump room.

## 2.5 PIPE HANGERS AND SUPPORTS

- A. Acceptable products: Hanger materials shall match piping material as required for dielectric isolation. All support systems shall be UL listed and FMG approved and shall meet ASTM B633, SC1 and SC3.
- B. Support all piping included in the Work of this Section with hangers and rods attached to the building structure. Hang piping in compliance with NFPA Standards and the requirements of this Section. Attach beam clamps before application of spray fire-proofing.
- C. Piping 2-1/2" and smaller: Carbon steel, adjustable swivel.
- D. Piping 3" and larger: Carbon steel, adjustable, clevis.
- E. Hanger Attachments
  - 1. Beam Clamps: Carbon steel hanger with lock nut and retaining strap or approved equal.
  - 2. Expansion Shields: Hilti HDI or approved equal.
  - 3. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods. Hilti HKD or approved equal.

F. Space hangers and supports for horizontal steel sprinkler piping according to the following schedule:

1.	<u>Pipe Size:</u>	<u>Maximum Hanger Spacing:</u>
2.	1-1/4" and smaller	8'-0"
3.	1-1/2" to 3"	10'-0"
4.	4" to 5"	12'-0"
5.	6" and larger	15'-0"

G. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded. Provide hanger rods sized according to the following schedule:

1.	<u>Pipe Size:</u>	<u>Minimum Rod Diameter:</u>
2.	4" and smaller	3/8"
3.	5", 6" and 8"	1/2"
4.	10" and 12"	5/8"

H. Hang standpipe and sprinkler piping to support the weight of the water filled pipe plus 250 pounds at the hanger.

I. Hang horizontal fire line piping to support the weight of five times the weight of the water filled pipe plus 250 pounds at the hanger.

J. Provide steel angle supports attached to the building structure to support piping below ductwork.

K. Riser Clamps: Carbon steel riser clamp, black or galvanized finish.

L. Floor Supports: Schedule 40 black steel adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

M. All vertical drops and run-out pipes shall be supported by split ring extension type hangers.

## 2.6 PIPE SLEEVES, PLATES AND ESCUTCHEONS, FIRESTOPPING AND SMOKEPROOFING

A. Where pipes pass through concrete walls or floors, the Fire Protection Subcontractor shall provide and set individual sleeves for each pipe and all other work under his charge. Sleeves shall be of sufficient size to provide 2" minimum air space around the pipe, or insulation on covered lines passing through it. All openings shall be sealed, smokeproofed and made tight as outlined in items below. This Subcontractor shall be responsible for the exact location of sleeves provided under this Contract and shall coordinate all requirements for piping sleeves. In the event that failure to do so requires cutting and patching, it shall be done at this Subcontractor's expense.

B. This Contractor, for work under his charge, shall determine the diameter of each individual wall opening or sleeve before ordering, fabricating or installing.

- C. Sleeves passing through lightproof or soundproof walls and floors and through firewalls shall be sealed and made tight using only approved materials and methods.
- D. Sleeves and wall openings shall not be used in any portions of the building where their use would impair the strength or construction features of the building. This Contractor shall immediately bring to the Architect's attention any situation which may promote this condition.
- E. Provide chrome plated brass escutcheons with set screw for exposed piping in all areas. In mechanical rooms use plain brass or cast iron escutcheons suitable for painting. All escutcheons shall be sized to fit the bare pipe or insulation in a snug and neat manner. They shall be of sufficient size to cover sleeved openings for the pipes and of sufficient depth to cover sleeves projecting above floors. Escutcheons shall be as manufactured by Beaton & Caldwell, Dearborn Brass, or Grinnell. All escutcheons shall be of 1-piece construction.
- F. Pipe sleeves shall be made of galvanized Schedule 40 pipe, 20 gauge galvanized steel or 16 gauge galvanized steel as follows:
  - 1. Sleeves passing through fire or smoke rated drywall construction shall be 16 gauge galvanized steel.
  - 2. Sleeves passing through masonry or concrete construction shall be Schedule 40 pipe.
  - 3. Sleeves through non-fire or smoke rated drywall construction shall be 20 gauge galvanized steel.
- G. Sleeves shall be set as follows:
  - 1. Set sleeves in wet areas 1" above finished floor (6" at penthouses and mechanical rooms).
  - 2. Set sleeves in dry areas within walls flush with floor.
  - 3. Set sleeves to be flush with each side of finished wall.
  - 4. Sleeves shall be set securely in place before concrete is poured.
  - 5. The Fire Protection Contractor shall review firestop and smokestop systems provided under Section 07270 – Fire Stopping, and coordinate the systems installation.
- H. This Contractor shall firestop and/or smokestop the space between the sleeves provided under this Contract as follows:
  - 1. Through-Penetration Firestopping in Fire Rated Construction
    - a. Systems or devices listed in the UL Categories XHCR and HXEL may be used, providing that they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.
    - b. Additional Requirements: Systems must withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL System or device.
    - c. Acceptable Manufacturers and Products

- 1) Those listed in the UL Fire Resistance directory for the UL System involved, including 3M, Dow Corning, BioFire Shield or approved equal.
  - 2) All products must be from a single manufacturer.
2. Smokestopping at Smoke Partitions
    - a. Any system complying with the requirements for through penetration firestopping in fire rated construction, as specified in Item H1, is acceptable, provided that the system provides the required smoke seal.
  3. Accessories
    - a. Fill, void or cavity materials: As classified under the UL Category XHHW.
    - b. Forming materials: As classified under UL Category XHKU in the Fire Resistance Directory.
  4. The materials, installation procedures, clean-up, safety precautions and requirements shall be in accordance with manufacturers published information.
- I. Piping which passes through exterior walls or foundation slabs on grade, shall have penetration closures similar to Link Seal of the modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous belt around the pipe and with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely watertight seal between the pipe and wall, reducing chances of cathodic reaction between these members. The Fire Protection Subcontractor, for work under his charge, shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabrication or installation. The inside diameter of the wall opening shall be sized to fit the pipe and assure a watertight joint. Where applicable, when installing seals, take into account the pipe O.D. if non-standard due to coating or jacketing.

## 2.7 WET-PIPE ALARM VALVE

- A. Wet alarm valve shall be UL listed and FMG approved for a wet pipe sprinkler system, complete with ductile iron body, flanged or grooved outlet, main drain valve, pressure gauges, alarm port, external bypass, hand hole with cover, hinged clapper assembly and other required trimmings. Valve shall be equal to Reliable Model E, Victaulic, Grinnel or Viking for constant pressure vertical installation with water motor and chrome plated gong. Water motor and gong shall be located on the outside of building. Supply pipe to gong and drain shall be IPS brass, galvanized steel or copper.
- B. Excess pressure kit to be Gamewell #26615-7 with associated control wiring, pressure switches, supervisory panel, mounting brackets, pump and motor. Motor shall operate from differential pressure switch. Furnish with alarm lights and alarm dry contacts. Pump capacity: 1 GPM, 175 psi max, 1/4 HP, 120V.

- C. Valve trim shall include pressure activated electric alarm switch.

## 2.8 DRY PIPE ALARM VALVE

- A. Dry pipe alarm valve shall be UL listed and FM approved for a dry pipe sprinkler system, complete with ductile iron body, flanged or grooved outlet, drain valve, primary water valve, ball drip valve, alarm test valve, priming chamber, fill line attachment, pressure gauges and air control valve assembly, Reliable Model D, Grinnel, Victaulic or Viking.
- B. Furnish and install listed air compressor to maintain air pressure in the dry pipe system, automatically. Compressor shall be sized as required for system in accordance with NFPA 13.
- C. To accelerate operation of the dry valve, furnish and install Reliable Model B or approved equal accelerator with integral anti-flooding device.
- D. Valve trim shall include pressure activated electric alarm switch and low air pressure alarm switch.

## 2.9 FIRE DEPARTMENT HOSE VALVES AND RELATED EQUIPMENT

- A. Provide Fire Department valves (FDV), fire valve cabinets where noted on the contract drawings. Hose cabinets shall be complete with 2 1/2 inch valves and shall be fully recessed type. Fire Department valves shall be adjustable type so that no valve is set for greater than 100 psig at outlet. Cabinets and valves shall be as manufactured by Croker, Potter-Roemer, Elkhart or Larsen, as follows:
  - 1. Fire Department Valves (FDV)
    - a. Fire Department valves shall be Croker #5015, Potter Roemer #4065 or approved equal, female inlet by male outlet, chrome plated or rough brass finish, 300 psi working pressure, complete with 2 1/2" female by 1 1/2" male outlet reducer and 1 1/2" cap and chain or,
    - b. Fire Department valves shall be Croker #5055, Potter Roemer #4085 or approved equal, pressure restricting, female inlet by male outlet, chrome plated or rough brass finish, 300 psi working pressure, complete with 2 1/2" female by 1 1/2" male outlet reducer and 1 1/2" cap and chain or,
    - c. Fire Department valve shall be of the pressure reducing type Underwriter's listed Croker #5610, Potter Roemer #4033 or approved equal. The hose valve shall be cast bronze and have a 2-1/2" female inlet and male outlet with cap and chain; accept 400 psi inlet pressure and reduce it in both FLOW and NO FLOW conditions at the outlet; be field ADJUSTABLE and set at the factory or SET IN THE FIELD without draining the standpipe riser.
    - d. Valve shall be mounted exposed, no cabinet in stairway unless noted otherwise on drawings.

- e. This Subcontractor shall include in this bid proposal the cost to adjust all pressure restricting and/or reducing valves in accordance with NFPA 14 or Local Authorities. This work shall be accomplished by the Manufacturer's Authorized Representative and attested to in writing to the Architect by The Fire Protection Subcontractor.
- 2. Fire Department Valve Cabinet
    - a. Fire Department Valve Cabinet (FDVC) shall be Croker Figure No. 2700, Potter Roemer #1810 or approved equal steel cabinet recessed style with plexiglass door. Fire department valve to be as outlined in item 1 above.
    - b. Fire Hose Cabinet (FHC) shall be Croker Figure No. 2300-A, Potter Roemer #1306-A or approved equal steel cabinet, recessed plexiglass door; Figure No. 5060 angle 1-1/2" pressure restricting valve, cadmium plated escutcheon; No. 3350 1-1/2" hose rack, No. 3365 nipple, 75'; 1-1/2" 3410 lined linen hose, No. 3467 brass all fog nozzle and No. 4410 carbon dioxide extinguisher.
  - 3. Roof Manifold
    - a. Roof outlet shall be Croker Figure No. 6861, Potter Roemer #5885 or approved equal standpipe roof outlet 2-1/2" x 2-1/2" x 2-1/2" x 6" hose valves shall be #5115 with caps and chains. Valve control shall be Croker No. 6642, Potter Roemer #5850 with extension rods, tee handle and cap and chain.
  - 4. All hose threads, both 2 1/2 and 1 1/2 inch, shall match Local Fire Department hose thread.

## 2.10 FIRE DEPARTMENT PUMPER CONNECTIONS

- A. Provide complete connection assemblies with body, identified face plate, snoots, caps and chains, with threads to suit Fire Department.
- B. Fire Department Pumper Connections
  - 1. Flush Mounted: Polished cast brass or polished chrome with escutcheon and four-way connection. Each inlet shall have a clapper valve, and plug and chain. Identify: "Auto-Spkr-Standpipe" or "Standpipe Connection". Potter-Roemer Series 5500 (for flush) Series 5740 & 5750 (for surface)
- C. Fire Pump Test Header
  - 1. Flush Mounted: Polished cast brass or polished chrome with escutcheon and four-way connection. Each outlet shall have a 2-1/2 NRS hose valves with loose bonnets, cap and chain. Identify: "Pump Test Connection" Potter-Roemer 5862, 5863, 5864 & 5865 (for flush).



2. On branch line to pumper connection, provide approved check valve installed in horizontal position, piping between check valve and pumper connection shall drain by an approved ball drip connection to nearest drain.
3. Installation of the fire department pumper connection shall be at the location shown on the drawings and as approved by the Architect and authority having jurisdiction.

## 2.11 ALARM DEVICES

- A. Water Flow Switches: Vane Type Switch for mounting horizontal or vertical, with two contacts rated 10 Amp at 120 volt AC, with adjustable 60 second time delay mechanism. Potter-Electric Model VSR-D, Notifier or System Sensor.
- B. Water Pressure Switches
  1. Main Alarm: Potter-Electric Signal Co. Model PS10-2A, or approved equal with two sets of double throw, single pole contacts with adequate pressure differential to prevent false operation.
  2. Supervisory: Potter-Electric Signal Co. Model PS40-2, or approved equal with two sets of double throw, single pole contacts with adequate pressure differential to prevent false operation.
- C. Supervisory Tamper Switches
  1. OS&Y Gate Valves: Tamper switch with two contacts rated 10 Amp at 120 volts AC. Potter-Electric Model OSYSU-A2 or approved equal.
  2. Post-Indicator Valves: Tamper switch with two contacts rated 10 amp at 120 volts AC. Potter-Electric Model PCVS-2 or approved equal.
  3. Water Motor Gong: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.
  4. Electrical alarm bell for weatherproof operation shall be 6", Potter Electrical or approved equal.
- D. Air Pressure Switch: For monitoring high/low pressure variations, 130 psi rated to detect system pressure from 3 to 90 psi.

## 2.12 SPRINKLER ACCESSORIES

- A. Alarm Testers: In place of the assembled inspector's test assembly, the following manufactured alarm testers may be used: Victaulic 720 Test Master III or AGF Model 1000 Test and Drain. Test stations in systems over 175 PSI shall be equipped with relief valve as required.
- B. Ball Drips: Grinnell Model F775, Reliable Model C, or Viking Model B-1.

C. Pressure Gages:

1. Water: 3-1/2 inch diameter, 0-300 psi. Reliable Model UA or approved equal. Provide at inlet and outlet of pumps and at top of all standpipes
2. Air: 3-1/2 inch diameter, 0-250 psi. Reliable Model UA or approved equal.

2.13 ELECTRICAL COMPONENTS

- A. Provide all electrical components including, but not limited to motors, contactors, and controllers as required for all equipment included under the Work of this Section. Controllers shall be wired to require a single power supply provided under Division 16.
- B. The fire protection subcontractor shall prepare a typewritten list of all equipment to which the electrical subcontractor shall make connections. This list shall include all electrical characteristics of each piece of equipment. Submit list to engineer and electrical contractor prior to purchasing any of this equipment.

2.14 FIRE PUMP AND ACCESSORIES (HORIZONTAL)

- A. Provide Aurora Model 5-481-15 Patterson, Peerless or Fairbanks-Morse horizontal split case, bronze, fitted, single-stage, double-suction, centrifugal pump with bronze shaft sleeve; case wearing rings and packed stuffing boxes with lantern ring, pump, driver, controller and accessories.
- B. Pump shall deliver 1,000 gpm against total head of 60 psig. Pump shall deliver 150 percent of rated capacity at no less than 65 percent of rated pressure. Pumps shall withstand 100 psig suction pressure. Shut-off pressure shall not exceed 120 percent of rated pressure.
- C. Pump shall include:
  1. (2) pressures gauges on suction and discharge of pump.
  2. (1) Circulation relief valve, 3/4 inch.
  3. (1) automatic air release valve, 1/2 inch.
  4. (1) concentric discharge increase.
  5. (1) eccentric suction reducer.
  6. (1) automatic ball drip valve.
  7. (1) approved flow meter installed in accordance with manufacturer.
  8. (1) coupling guard.
- D. Motor shall be horizontal, foot-mounted, open drip-proof, 72 HP ball bearing type "P" face, 1770 RPM, Solid State Soft Start squirrel cage induction motor, wound for 480V, AC, three phase, 60 Hz. Locked rotor current shall not exceed values specified in NFPA-20.
- E. Provide jockey pump with capacity of 10 gpm at 72 psi.
  1. Pump shall be Aurora Model 93 or approved equal, turbine pump.

2. Jockey pump shall be coupled to 3 HP, 3,500 rpm, three-phase, 60 Hz, 480V, with piped relief valve.
  3. Furnish a jockey pump controller with HOA switch, fusible disconnect, pressure switch and minimum run period timer in a NEMA 2 enclosure.
  4. Control circuit transformer and power available light.
- F. Submittal drawings shall include certified dimensional prints, bill of material, and curves of performance characteristics on pump unit proposed. Pumps shall be hydrostatically tested to twice shut-off pressure, or to 250 psi, whichever is greater.
- G. Provide services of factory-trained engineer to supervise installation and to conduct final field acceptance tests.

## 2.15 FIRE PUMP CONTROLLER

- A. The main fire pump controller shall be a factory assembled, wired and tested unit and shall conform to all the requirements of the latest edition of NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection* and NFPA 70, *National Electrical Code*. The panel shall be as manufactured by Firetrol, Joselyn Clark, or Hubbell and shall have local representation with 24/7 support. Panel shall be provided with 7 year warranty on power components when used with USEM motor.
- B. The controller shall be listed by Underwriters Laboratories, Inc., in accordance with UL218, *Standard for Fire Pump Controllers*, CSA, and Canadian Standards Association CSA-C22.2, *Standard for Industrial Control Equipment (cULus)*, approved by Factory Mutual.
- C. The controller shall be of the combined manual and automatic type designed for solid state soft starting of the fire pump motor having the horsepower, volt-age, phase and frequency rating shown on the plans and drawings. The controller components shall be housed in a NEMA Type 2 (IEC IP11) drip-proof, wall mounted enclosure.
- D. All controller components shall be front mounted, wired and front accessible for maintenance. The minimum withstand rating of the controllers shall not be less than 100,000 Amps RMS Symmetrical at 200-600 Volts.
- E. The controller shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked and operated with a single, externally mounted handle. When moving the handle from OFF to ON, the interlocking mechanism shall sequence the isolating disconnect switch ON first, and then the circuit breaker. When the handle is moved from ON to OFF, the interlocking mechanism shall sequence the circuit breaker OFF first, and then the isolating disconnect switch.
- F. The isolating disconnect switch/circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism. The isolating disconnect switch/circuit breaker shall be capable of being padlocked in the OFF position for installation and maintenance safety, and shall also be

capable of being locked in the ON position without affecting the tripping characteristics of the circuit breaker. The controller door shall have a locking type handle and three-point cam and roller vault type hardware. The circuit breaker trip curve adjustment shall be factory set, tested and sealed for the full load amps of the connected motor. The circuit breaker shall be capable of being field tested to verify actual pick up, locked rotor, and instantaneous trip points after field installation without disturbing incoming line and load conductors.

- G. The fire pump controller shall feature an operator interface with user keypad. The interface shall monitor and display motor operating conditions, including all alarms, events, and pressure conditions. All alarms, events, and pressure conditions shall be displayed with a time and date stamp. The display shall be a 2-line, 20-character, vacuum fluorescent, dot matrix type designed to allow easy viewing from all angles and in all light conditions. The display and interface shall be NEMA rated for Type 2, 3R, 4, 4X, and 12 protection and shall be fully accessible without opening the controller door. The display and user interface shall utilize multiple levels of password protection for system security. A minimum of 3 password levels shall be provided. The display shall be capable of being programmed for any language.
- H. The fire pump controller operator interface shall be capable of displaying true RMS digital motor voltage and current measurements for all three phases simultaneously. Displays requiring push-button and selector switches to toggle between phases or current and voltage shall not be accepted.
- I. The digital display shall be capable of indicating text messages for the status and alarm conditions of the fire pump controller.
- J. LED indicators, visible with the door closed, shall indicate:
  - 1. Power On
  - 2. Pump Running
  - 3. Alarm
  - 4. Deluge Open
  - 5. Phase Failure
  - 6. Interlock On
  - 7. Emerg. Isolating Switch Open
  - 8. Low System Pressure
  - 9. Transfer Switch Normal
  - 10. Transfer Switch Emergency
  - 11. Phase Reversal
- K. The digital display shall monitor the system and log the following data:
  - 1. Motor Calls/Starts
  - 2. Last Trip Currents
  - 3. Last Breaker Trip
  - 4. Minimum Voltages
  - 5. Maximum Voltages
  - 6. Last Phase Failure
  - 7. Min/Max Pressure

8. Elapsed Motor Run Time
  9. Elapsed Power On Time
  10. Maximum Run Currents
  11. Minimum Run Currents
  12. Last Motor Run Time
  13. Last Start Currents
  14. Min/Max Frequency
- L. Memory - The controller shall record all operational and alarm events to system memory. All events shall be time and date stamped and include an index number- The system memory shall have the capability of storing 3000 events and allow the user access to the event log via the user interface. The user shall have the ability to scroll through the stored messages in groups of 1, 10, or 100.
- M. Floppy Disk Drive - The controller shall include a floppy disk drive to save all operational and alarm events. The floppy disk drive shall have the ability to store up to 1 year's worth of data (under normal operating conditions) in individual monthly files. Each event shall be time and date stamped. The controller shall also have the capability to save settings and values to disk through the user interface.
- N. Communications - The controller shall feature two independent communications ports to allow connectivity to computers, modems, or building management systems.
- O. The controller shall be supplied with a solid state pressure transducer with a range of 0-300 psi (0-20.7 bar)  $\pm 1$  psi. The solid state pressure switch shall be used for both display of the system pressure and control of the fire pump controller. Systems using analog pressure devices or mercury switches for operational control will not be accepted.
- P. The START, STOP and SYSTEM PRESSURE shall be digitally displayed and adjustable through the user interface. The pressure transducer shall be mounted inside the controller to prevent accidental damage. The pressure transducer shall be directly pipe mounted to a bulkhead pipe coupling without any other supporting members. Field connections shall be made externally at the controller coupling to pre-vent distortion of the pressure switch element and mechanism.
- Q. A digitally set On Delay (Sequential Start) timer shall be provided as standard. Upon a call to start, the user interface shall display a message indicating the remaining time value of the On Delay timer.
- R. The controller shall be field programmable for manual stop or automatic stop. If set for automatic stop-ping, the controller shall allow the user to select either a Minimum Run Timer or an Off Delay Timer. Both timers shall be programmable through the user interface.
- S. A nonadjustable restart delay timer shall be provided to allow the residual voltage of the motor to decay prior to restarting the motor. At least 2 seconds, but no more than 3 seconds, shall elapse between stopping and restarting the pump motor.

- T. A weekly test timer shall be provided as standard. The controller shall have the ability to program the time, date, and frequency of the weekly test. In addition, the controller shall have the capability to display a preventative maintenance message for a service inspection. The message text and frequency of occurrence shall be programmable through the user interface.
- U. A Lamp Test feature shall be included. The user interface shall also have the ability to display the status of the system inputs and outputs.
- V. The controller shall not start the fire pump motor under a single-phase condition. If the motor is already running when a phase loss occurs, the controller shall continue to run the motor, but still display a Phase Failure alarm.

## 2.16 FIRE PUMP TRANSFER SWITCH

- A. The main fire pump controller shall be factory assembled and wired with a power transfer switch listed by Underwrites' Laboratories, Inc. for transfer switch and fire pump service. The power transfer switch shall be approved by Factory Mutual. The power transfer switch and fire pump controller shall be factory assembled, wired and tested as a single unit and shall conform to all requirements of the latest edition of NFPA20, Centrifugal Fire Pumps and NFPA 70, National Electrical Code.
- B. The power transfer switch shall be housed within the fire pump controller enclosure or in a NEMA Type 2 (IEC IP11) drip-proof enclosure attached directly to the fire pump controller. Where the power transfer switch is provided in an attached enclosure, the enclosures shall be fitted so that the assembly constitutes a single unit. The fire pump controller/power transfer switch shall be factory assembled, wired and tested as a unit prior to shipment.
- C. The power transfer switch shall include a motor rated disconnect/isolating switch capable of interrupting the motor locked rotor current. The disconnect/isolating switch shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism. The disconnect/isolating switch shall be capable of being padlocked in the OFF position with up to three padlocks for installation and maintenance safety, and shall also be capable of being locked in the ON position. The enclosure door shall have a locking type handle and three-point cam and roller type vault hardware.
- D. An auxiliary contact shall be provided on the transfer switch to prevent starting of the emergency generator set when the transfer switch or the main fire pump controller are being serviced.
- E. The transfer switch circuitry shall be capable of sensing both the normal power source and the emergency power source. The normal power source pickup shall be set at 95 nominal voltage. The emergency power source shall be set to pick up at 90 nominal voltage and 95 nominal frequency. All voltage sensing, frequency sensing, and time delays shall be field adjustable to accommodate individual installation requirements. The transfer signal shall be delayed for one second, delaying the transfer and engine start signals so as to compensate for momentary, normal power outages. An automatic delay of three seconds shall be provided upon transfer to

or from the emergency power source to allow the motor to slow sufficiently, preventing line disturbances that could trip either the generator set or fire pump circuit breakers.

- F. The transfer switch shall have TRANSFER SWITCH NORMAL, TRANSFER SWITCH EMERGENCY and EMERGENCY ISOLATING SWITCH OFF LED's, TEST and TRANSFER BYPASS switches, an audible alarm device and SILENCE ALARM pushbutton mounted on the flange of the enclosure. The power transfer switch shall be furnished with both normally open and normally closed auxiliary contacts for an engine start signal when normal power failure occurs. Auxiliary contacts shall also be provided and wired to terminals to indicate the transfer switch position. The transfer switch shall be electrically operated and mechanically held, and shall be capable of being operated by a manual transfer mechanism located on the switch.

## 2.17 EARTHQUAKE PROTECTION AND SEISMIC RESTRAINTS

- A. The Fire Protection Subcontractor shall provide all necessary design and materials for seismic restraint and protection of piping and devices against damage where subject to earthquake as required for the entire fire protection system within the building. All isolation and seismic devices shall be the product of a single manufacturer. Products of other manufacturers are acceptable provided their systems strictly comply with this section of the specifications. Provide isolation materials and seismic restraints complete and as manufactured by Mason Industries, Tolco or approved equal.
  - 1. The work under this section shall include the design, furnishing and installation of all restraint devices and systems as may be required for the fire protection system including, but not necessarily limited to, the following:
    - 2. All fire protection equipment and devices such as pumps, air compressors, tanks, etc.
    - 3. All fire protection system piping as required.
    - 4. Piping penetrations through floors and walls.
    - 5. Sleeves with clearances around the outside, as recommended.
    - 6. Equipment isolation bases.
    - 7. Piping flexible connectors.
    - 8. Seismic restrains for isolated equipment.
    - 9. Seismic restraints for non-isolated equipment.
    - 10. Certification of seismic restraint designs.
    - 11. Six (6) elbow swing joints at all building seismic separations as required by NFPA #13.
- B. Submit ten (10) copies of descriptive data for all products and materials, including the following:
  - 1. Catalog cuts and data sheets for the specific isolators, restrains and all other items to be utilized.
  - 2. Details of methods of sleeving, fire protection, smokeproofing and isolation for pipes penetrating walls and slabs.
  - 3. Specific details of seismic restraints and anchors, including number, size and locations for each piece of equipment.

4. Calculations to support seismic restraint designs.
  5. All calculations, details and other submittal materials shall be sealed and signed by a structural or civil engineer registered in the state and qualified to perform seismic design calculations.
  6. A seismic design liability insurance certificate that must accompany all submittals.
- C. Code and standard requirements shall include, but not be limited to:
1. Applicable BOCA-NBC with any additional state or local requirements.
  2. NFPA 13, 14, 20 and 24 and other applicable NFPA standards.
  3. All state and local codes.
- D. Manufacturers working in this section must provide a seismic design liability insurance certificate and certify their ability to provide engineering and design as required by this section. This certificate shall be submitted to the Architect for review prior to any submittals.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. This is a performance specification. It requires performance of design work, preparation and submission of drawings, procurement of approvals and provision of complete functional system of automatic sprinklers/standpipes. As a result, this Section serves dual purposes of providing specifications and indicating design criteria for Contractor's use and guidance in designing systems and preparing sprinkler drawings for approvals.
- B. The contract documents intend to show only the scope of the design, the Fire Protection Contractor shall be responsible for the correct installation of this work in a manner satisfactory to the best practices of his trade to complete the scope of this subcontract in all respects. No roughing work shall be accomplished until the pertinent manufacturer's shop drawings are approved.
- C. The location of piping as indicated on the Drawings, unless otherwise noted, is diagrammatic only, and the exact locations shall be determined in the field. The run and arrangement of all pipes shall be approximately as shown on the Drawings, as directed during installation, in strict accordance with NFPA Pamphlets, and as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and neatly spaced. All risers shall be erected true and plumb, parallel with walls and other pipes, and neatly spaced. All horizontal runs of piping, except where concealed in partitions, shall be kept as high as possible and close to walls. Where possible, adjacent pipe lines, both heating and plumbing, shall be grouped in the same vertical or horizontal planes. All piping shall be concealed and concealed piping shall have a minimum number of fittings. Piping shall not interfere with the operation or accessibility of doors, windows, access panels, valves, H & V unit access, air flow patterns, or equipment, and shall not encroach on aisles or passageways. All piping shall be installed to preserve access to all valves, drains and equipment. Pipe will not be permitted to pass through beams or ribs. Make



such offsets and deviations from the Drawings as may become necessary to meet actual field conditions.

- D. The Fire Protection Contractor shall be responsible for the correctness of field dimensions and shall check for himself all grades, lines, measurements, and other data in any way effecting his work. He shall refer to the project phasing schedule together with architectural and structural drawings of other Trades for a full comprehension of the extent of the work to be performed and to avoid interference, and shall not be entitled to any extra compensation for any additional work or expense arising from his failure to do so. In case interference develops the Architect shall decide which work is to be relocated, regardless of which was first installed. Work installed by the Fire Protection Contractor which is improperly located and/or interferes with or modifies either the phasing schedule or the architectural or structural design, shall be changed as directed by the Architect, and all costs incidental to such changes shall be paid by the Fire Protection Contractor.
- E. The Fire Protection Contractor shall coordinate all his work with the work of all other Trades, and shall so arrange his work that there will be no delay in the proper installation and completion of any part or parts of each respective work wherein it may be interrelated with his, so that generally all construction work can proceed in its natural sequence without unnecessary delay, close coordination is also required with the HVAC, Plumbing and Electrical Contractors in areas serving these Trades. The Fire Protection contractor shall also participate with all other Contractors in the process to prepare a complete set of coordination drawings prior to installation of any systems.
- F. Contact between piping and dissimilar metals such as hangers, building structural work, or equipment shall be avoided to prevent galvanic action.
- G. Pipe shall be cut accurately to measurements established at the site and shall be worked into place without springing or forcing. All pipe, regardless of how cut throughout the job, shall be reamed smooth and all burrs removed before being installed. Pipe shall not be split, bent, flattened, nor otherwise injured either before or during the installation. Full lengths of pipes shall be used wherever possible and short lengths of pipe connected with couplings will not be permitted.
- H. The Fire Protection Contractor shall use every precaution in the installation of all piping to prevent dirt, chips, or other foreign materials entering the inside of piping. All pipes shall be clean and blown out to the satisfaction of the Architect before closing of any line. Keep the ends of piping capped or blind flanged during the construction of the system to keep out dirt or other foreign matter. The plugs and caps are to remain until permanent and final installation is made. The use of paper, waste, rags and so forth to close openings will not be permitted.
- I. Unions or flanges shall be installed at all equipment valves and at such other places as may be necessary to disconnect piping or at each piece of equipment or accessory which may have to be disconnected to make repairs.
- J. Bushing will not be inserted in fittings for reduction in size where fittings of required size are manufactured.

- K. The Fire Protection Contractor shall also provide the necessary data and supervision for the provision of all holes in the structure, and also for the installation of equipment foundations, including bolt hole templates, weights and manufacturer's recommendations for proper emplacement design. This shall be furnished to the Construction Manager and other related subtrades.
- L. Equipment and accessories shall be set level, plumb and in proper alignment with reference to adjacent walls. All surfaces coming in contact with walls, floors or other equipment shall have properly planed surfaces with suitable contact on wall and floors.
- M. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible, before start of spray fire proofing work. Piping and equipment that interfere with proper application of fireproofing shall be installed after completion of spray fire proofing work. Patch and repair spray fireproofing cut or damaged during course of work specified under this Section. Trade responsible for damage shall bear cost of repair.

### 3.2 HYDRANT FLOW TEST

- A. Notifications: Notify the authorities having jurisdiction at least three working days in advance of performing the flow test.
- B. Perform hydrant flow test in compliance with NFPA Standards 13 and 291. Perform test as close as possible to new wet-tap connection for new fire service.
  - 1. Pressure drop from static to residual shall be at least 25 percent of the static pressure. The flow at the residual pressure shall meet or exceed the preliminary estimated design flow. Open additional hydrant butts as required to obtain the specified pressure drop or to match the preliminary estimated design flow.
- C. Record elevations of the test hydrants and submit hydraulic graph(s) indicating test results for review and approval before submitting hydraulic calculations and working plans.
- D. Hydraulic graph shall indicate elevation adjustments and water supply curve at wet-tap connection.

### 3.3 HYDRAULICALLY CALCULATED SPRINKLER SYSTEM

- A. The Contractor shall provide a hydraulically designed system in complete accordance with and as defined in applicable National Fire Protection Standards.
- B. Verification of Hydraulic Information
  - 1. The contractor shall perform hydrant flow tests to establish water supply availability. Water supply information shall be provided on shop drawings as outlined in NFPA 13.

2. The Contractor shall confirm that hazard classifications/density requirements conform with the Owner's fire insurance underwriter's requirements and those of other authorities having jurisdiction.
- C. Accompanying sprinkler shop drawings submitted to the Architect shall bear all sprinkler system requirements, water supply data, graph and work sheets all as defined by NFPA. The hydraulic graph shall include the following information:
1. Hydrant flow test curve.
  2. Adjust flow test for friction and elevation at new wet tap connection.
  3. System friction loss curve for sprinkler system with inside hose stream.
  4. Available outside hose stream flow.
  5. Fire pump discharge curve.
- D. All calculations shall assume a 10 psi deterioration in static and residual pressures in the hydrant flow test results.
- E. Velocity shall not exceed 20 FPS.
- F. In addition to the above noted requirements, the hydraulic calculations shall include:
1. The hydraulically most remote area for each hazard classification/density requirements as noted on the contract documents.
  2. If combination risers are shown interconnected with sprinkler piping, hydraulic calculations shall show the remote area being supplied solely from the hydraulically most remote combination riser.
  3. Additional hydraulic calculations shall be submitted, when requested, which demonstrate that the contractor's selected remote areas are indeed the hydraulically most demanding as well as remote.

### 3.4 INSTALLATION OF PIPING AND EQUIPMENT

- A. Install the Work of this Section in compliance with the referenced NFPA Standards. Coordinate installation with work of other sections and install piping level or pitched back to main riser or low point drain. Provide drain valve on trapped piping. Install all sprinkler heads with return bend drops to ceilings.
- B. Install fire line piping and combined standpipe risers generally as shown on the Drawings. Run piping concealed above ceilings and within furred spaces. Take special care to locate risers within pipe chases as indicated on the architectural drawings. Obtain approval from the Architect for piping locations which require furrings not indicated on the Contract Drawings. Provide pressure gauges with shut-off cock at top and base of risers.
- C. Provide 3/4-inch hose end drain valve with cap and chain at base of standpipe riser. Locate drain valve downstream of riser isolation valve.

- D. Provide inspectors test valve assemblies for each flow switch and 3 inch sprinkler test drain stacks at each combined standpipe and spill to drain. Provide main inspector's test assembly at most remote point of system.
- E. Install equipment and products provided under this Section in compliance with the product listing and the manufacturer's installation instructions.
- F. Install chrome-plated escutcheons where piping passes through finished surfaces.

### 3.5 WATER SERVICE

- A. Route water service piping as shown on Drawings. Provide offsets required to avoid conflicts with ledge and other unforeseen circumstances. Work associated with street main tapping and water service piping to building shall meet requirement of local authority. When work is not in progress, plug open ends of pipe to ensure that foreign matter does not enter piping system.
- B. Tap existing main under pressure with full tapping sleeve. Tapping valve shall be UL listed and FM approved, iron body, bronze-mounted, non-rising stem, square head, mechanical joint end, 175 psi working pressure with valve box extensions to grade; box shall be approved by local Water Department.
- C. Provide thrust blocks and tie rods for fittings used to change direction of water service piping. Where adequate bearing cannot be obtained for thrust blocks, provide tie rods. Refer to Drawing details for information regarding size of thrust blocks.
- D. Coordinate with pipe bedding provided under Division 2. Keep excavation open until system has been inspected, tested and approved.
- E. Flush and test water service piping in accordance with NFPA #24 and other applicable NFPA Standards. Leakage shall not exceed 2 quarts per hour per 100 joints regardless of pipe diameter. Submit copies of test certificates required by NFPA #24 to the Architect before connection to building fire protection system. Flush water service and disinfect if required by Authorities.

### 3.6 FIRE PUMP INSTALLATION

- A. Install complete fire pump system in compliance with NFPA-20.
- B. Provide a minimum of 2 feet clearance all around pump base.
- C. Install fire pump test header at location shown on the drawings.
- D. Pipe all drains and relief valve to floor drain.
- E. Connect jockey pump sensing line after double check valve assembly.

- F. Provide piping to jockey pump and controller.

### 3.7 FIRE DEPARTMENT HOSE CONNECTION INSTALLATION

- A. Install check valve in fire department pumper connection piping at point of connection to the system. Pitch Fire Department connection piping to drain. Provide automatic ball drip at low point and pipe discharge and spill into floor drain or mop basin. Centerline of pumper connection shall be between 2'-0" to 3'-6" above finish grade.
- B. Install Fire Department valves between 3'-6" to 4'-6" above finish floor.
- C. Install Fire Department valve Cabinets 4'-6" above finish floor to the top of the cabinet.
- D. Install roof manifold 3'-6" above roof. Provide isolation valve at roof access in heated space with tamper switch to indicate the valve is normally closed. Provide manual drain valve and automatic ball drip valve both piped to drain or exterior.
- E. Install fire pump test header piping pitched to automatic ball drip. Pipe discharge of drain valve to floor drain. Provide tamper switch on control valve to indicate the valve is normally closed.

### 3.8 INSTALLATION AND SPACING OF SPRINKLER HEADS

- A. Sprinkler Head Installation
  - 1. Sprinkler spacing, densities and design shall comply with NFPA and the Owner's Insurance Underwriter.
- B. Location of sprinkler heads in ceiling tiles:
  - 1. Refer to Architectural reflected ceiling plans and room finish schedules for ceiling tile types. Mount sprinklers in center of tiles.
  - 2. Align sprinkler heads with ceiling components such as lighting fixtures, HVAC diffusers and smoke detectors.
- C. Provide additional heads as required by NFPA 13, including appendices to protect areas where ceiling head spray pattern is obstructed and below ducts and equipment 4 feet wide or wider. Mechanical room sprinkler layouts shall be based on approved ductwork submittals. Additional sprinkler heads required to provide complete sprinkler protection due to obstructions and/or coordination shall be provided at no additional cost to the Owner.
- D. Provide sprinkler heads within privacy curtains or obtain written confirmation from the Owner that 18-inch curtain drop hangers will be used.
- E. Provide upright heads within stair towers at the top and bottom of the stair tower.
- F. Provide sprinkler head spray baffles to shield direct water spray from electrical equipment.

- G. Provide sprinkler protection in electric rooms, elevator machine rooms and hoistways. Provide an indicating shut-off valve with tamper switch on the branch line located in an accessible area outside the protected space.

### 3.9 TEMPORARY STANDPIPE SYSTEMS

- A. All standpipe risers shall continue up through the floors and temporary hose, nozzles and valves provided as required as the floors are erected for fire protection during construction. Standpipes shall be supplied through a temporary Siamese inlet at grade located where directed by the Fire Department. Access to temporary Siamese inlet connection shall be kept clear and accessible at all times. It shall be the responsibility of this Subcontractor to insure this temporary fire protection supply be available at all times. All valves shall be properly adjusted for the maximum pressure setting allowable.

### 3.10 VALVE TAGS AND CHARTS

- A. All valves on pipes of every description shall have neat circular brass valve tags of at least 1-1/2 inches in diameter, attached with brass hooks to each valve stem. Stamp on these valve tags in letters as large as practicable the number of the valve and the service and zone, such as "S.P.", "D", for standpipe, drain, respectively. The numbers of each service shall be consecutive.
- B. These numbers shall correspond to numbers indicated for valves on the record drawings and on two printed detailed lists. These printed lists shall state the numbers and locations of each valve and the fixture or group of fixtures which it controls, and other necessary information, such as requiring the opening or closing of another valve or valves, when any one valve is to be opened or closed.
- C. These printed lists shall be typed and shall be framed under glass, and mounted as directed by the Architect.
- D. Copies of charts shall be included in O&M manuals.

### 3.11 IDENTIFICATION

- A. All labeling of piping, materials and equipment, as outlined hereinafter for identification purposes, shall be performed by this Contractor.
- B. Piping systems shall be identified with approved snap-on covers designating services and direction of flow. Location of identification covers shall be near access panels wherever possible on each riser and branch main, equipment, and on both sides of valves. The markers shall be as manufactured by WH Brady Co., Westline Products, Seton Name Plate Co., or approved equal.

- C. Install markers on cleaned or painted piping only after piping is complete and has been accepted by the Architect.
- D. Letters shall not be less than 1-1/2 inches in height. Arrows shall not be less than 9 inches long. Identification shall be installed on pipes above hung ceiling and furred spaces.
- E. All systems shall be identified at intervals of approximately 20", every change of direction and on both sides of wall where pipes pass through walls.

### 3.12 CORE DRILLING

- A. This Contractor shall perform all core drilling required for the installation of the fire protection system. Locate all required openings and prior to coring coordinate the opening with the Construction Manager. Thoroughly investigate the existing conditions in the vicinity of the required opening prior to coring. Care must be taken so as not to disturb the existing building systems. Locate all other openings required for the Construction Manager. Patching of existing walls and openings shall be performed by the respective Trade responsible for the finish material in which the opening is made.
- B. Before coring is performed, submit drawings showing location of cores to Structural Engineers for their review.

### 3.13 CLEANING OF SYSTEMS

- A. Before the Fire Protection Systems are accepted, all equipment shall be thoroughly cleaned to remove all dust, dirt, and/or other foreign matter which may be detrimental to the operation of the Systems or building finishes. The system shall be cleaned with a solution of caustic soda, trisodium or approved equal.
- B. After the installation is complete, equipment with factory finished surfaces shall be cleaned. Damaged or scratched spots shall be touched up with the same type and color paint as applied at the Factory.
- C. All equipment that is to receive finish paint by the Painting Contractor shall be cleaned by this Contractor and left ready to have surfaces prepared to receive paint.

### 3.14 EQUIPMENT ACCESS REQUIREMENTS AND ACCESS PANELS

- A. All work shall be installed so that all parts requiring inspection, operation, maintenance and repair are readily accessible as approved by the Owner. Minor deviations from the Drawing may be made to accomplish this, but changes of magnitude shall not be made prior to written approval from the Architect.
- B. Furnish access panels if required in walls and ceilings as required to permit access for adjustment, removal and the replacement and servicing of all equipment, and all other items

requiring maintenance and adjustments. Access panels shall be installed by the Trade determined by the Construction Manager.

- C. Access panels shall be 12" X 12" minimum size and constructed of steel with primer coat of rust inhibitive paint and shall have continuous piano hinge, as manufactured by Inland Steel Products, Milcor, Walsh-Hannon or approved equal. Panel shall be key operated cylinders, keyed alike. Key lock system shall be coordinated with the Owner and shall be as approved by the Architect. Provide six (6) keys of type used for Owner's use.

### 3.15 SIGNS

- A. Signs and nameplates in accordance with NFPA standards and/or this specification shall be provided at all drains, test and alarm valves and other areas as required by NFPA Standards.

### 3.16 MATERIALS AND EQUIPMENT HANDLING

- A. This Contractor shall do all handling of his materials and equipment and the resulting cleanup, at his expense, in a safe and satisfactory manner. Special attention shall be paid to the protection of life and property and the equipment or apparatus handled, and any corresponding damages shall be replaced, repaired or paid for by this Contractor, as approved by the Architect. This Contractor shall provide all rigging, hoisting and staging up to 8'-0". Staging, hoisting and rigging over 8'-0" in height shall be provided by the General Contractor.

### 3.17 MAINTENANCE AND PROTECTION OF MATERIALS

- A. This Contractor shall be responsible for the maintenance and protection, from loss or damage of all causes, of all equipment, materials and tools supplied by him and stored or installed on the job site, until substantial completion and use and occupancy.
- B. This Contractor shall store his materials and equipment in the location designated by the Construction Manager and maintains the storage area in a safe condition.

### 3.18 CLEANUP

- A. After completion of the work, all tools and other equipment shall be removed from the building. All excess materials shall be removed and the building left broom clean. All cabinets, valves, and equipment shall be cleaned and polished.
- B. This Contractor shall clean, patch and repair any material and finish of the building or its contents damaged during the execution of this Contract.



### 3.19 TESTING AND INSPECTION

- A. This Contractor shall obtain and pay for all the inspection and tests required for this Section of the work. Defects discovered in work, materials and/or equipment shall be replaced at no cost to the Owner, and the inspection and test shall be repeated. When work is completed, this Contractor shall furnish a Certificate of Inspection and Approval to the Owner before final payment of the Contract will be allowed.
- B. Test sprinkler piping and make watertight before painting and before concealment. Make partial tests as required, during the progress of the work. All tests shall be witnessed by the Owner's representative, Authorities Having Jurisdiction and a representative of the Engineer.
- C. Test systems according to provisions of NFPA Standards and the additional requirements of the approving authority and this Section.
- D. Modified sprinkler system shall be tested to a hydrostatic test of 200 psi or 50 psi higher than the normal working pressure of the system for (2) hours without loss as specified in NFPA 13.
- E. This Contractor shall, with the parties noted herein, establish procedures to witness testing that are acceptable to the parties noted herein. All parties noted herein shall be notified in writing of the accepted testing procedure prior to any testing. This Contractor shall notify parties designated to witness testing at least 48 hours in advance of scheduled testing.
- F. Conditions requiring testing in excess of the minimum requirements noted herein shall be performed in accordance with NFPA Standards and any requirements of Authorities Having Jurisdiction.
- G. Should the Owner, Engineer or any Authority Having Jurisdiction require, this Contractor shall provide factory trained, manufactures authorized representatives to perform testing on any equipment and/or devices that may be an integral part of this Specification.
- H. Dispose of test water and wastes after tests are complete, in a manner satisfactory to the Owner and Local Authorities.
- I. Furnish to the Engineer completely executed test certificates with signatures of those required to witness testing. Test certificate forms shall follow NFPA formats as a minimum requirement.
- J. Test and certify water flow, pressure and supervisory tamper switches.
- K. Test fire department connection piping at 300 psi for one hour.
- L. Test and certify water flow, pressure, and supervisory tamper switches.
- M. Dry Systems: Perform both hydrostatic and pneumatic pressure tests and dry pipe valve operating work test.
  - 1. Hydrostatic Test: Maintain at least 200 psi or 50 psi in excess of the maximum working pressure, for at least two hours.

2. Pneumatic Test: Maintain 40 psi air pressure for 24 hours. Correct all leaks which result in a pressure loss in excess of 1-1/2 psi.
  3. Operating Working Test: Perform test and complete Contractor's material and test certificate.
- N. Fire Pump: Perform test in compliance with NFPA Standard 20 and complete pump acceptance test data sheets.
1. Notify the authorities having jurisdiction at least three days in advance of the scheduled test.
  2. A factory certified pump performance tests shall be done prior to shipment of the unit. Results to be furnished to the Engineer.
- O. Complete working tests of all systems in accordance with NFPA standards.

### 3.20 MANUFACTURER'S REPRESENTATIVE AND COMMISSIONING OF SYSTEMS

- A. The Fire Protection Subcontractor shall provide, at the appropriate time or as directed by the Architect, the on-site services of a competent factory trained Engineer or authorized representative of a particular manufacturer of equipment, such as for the fire pump, to instruct the Owner, inspect, adjust, test and place in proper operating condition any item provided by him, as applicable.
- B. The Fire Protection Subcontractor, as applicable, shall commission and set in operating condition all major equipment and systems, in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect's representatives. In no case will major systems and equipment be commissioned by any of the Fire Protection Subcontractor's forces alone, without the assistance or presence of the equipment manufacturers.
- C. A written report shall be issued by the particular equipment manufacturer and The Fire Protection Subcontractor summarizing the results of the commissioning and performance of each system for the Architect's record. No additional compensation will be allowed for any additional Subcontractors required for such services.
- D. The Fire Protection Subcontractor shall prepare and submit to the Architect for acceptance, a schedule of anticipated system commissioning. No system shall be commissioned without prior acceptance of the schedule by the Architect and Owner. No system shall be commissioned prior to submittal and acceptance of the operations and maintenance manuals.

### 3.21 INSPECTION SERVICE

- A. After completion of the fire protection work and at start of the guarantee year, The Fire Protection Subcontractor shall execute the National Automatic Sprinkler and Fire Control Association, Inc. Standard Form of Inspection Agreement without charge to the Owner, calling for 4 inspections of the system during the guarantee year. During the year, inspections shall be

made as per the Inspection Agreement plus the following maintenance shall be performed on the last inspection:

1. Operation of all control valves
  2. Lubrication of stems of all control valves
  3. Operation of all alarms
  4. Cleaning of alarm valves and parts
- B. The standard form, "Report of Inspection" shall be filled out in triplicate after each inspection and copies sent to the Owner and the Owner's insuring agency.
- C. All inspections and maintenance shall be in accordance with applicable NFPA Standards, including NFPA #25, as a minimum. Requirements of Owner's Insurance and other Authorities Having Jurisdictions are also a part of this service.

END OF SECTION