21 1000 – Fire Protection Systems

1. Design Statement

    a. The new and/or modified fire protection systems shall have the following characteristics

        i. Consider occupant and building safety.

        ii. No adverse effect on public water supply and existing infrastructure. If any renovation, addition, or system modification creates demands beyond the capacity of existing supply or system infrastructure, the designer shall immediately bring this information to the attention of the owner's project manager, in writing, for further direction.

        iii. Flexibility for future changes.

        iv. Durability.

        v. Ease of maintenance.

        vi. Reliability and redundancy

    b. Every effort will be made to design, layout and install equipment in locations which will encourage routine preventive maintenance by providing unencumbered access for maintenance personnel for maintenance, operations and replacement. Manual isolation valves will be provided to enable servicing, expansion of, renovation or construction of the existing facility

    c. All systems and equipment shall be designed in accordance with Massachusetts State Building Code, requirements of the National Fire Protection Association (NFPA), National Electrical Code (NEC) and the Owner's insurance underwriter

    d. The designer shall provide design documents which direct all involved contractors to provide fire protection systems, and all associated equipment and components which achieve the standards contained in this document.

2. Codes, Standards and References

    a. All materials and workmanship shall comply with all applicable Codes, Specifications, Local and State Ordinances, Industry Standards and Utility Company Regulations, latest editions.

    b. In case of difference between Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations and the Contract Documents, the Fire

Protection Contractor, as applicable, shall promptly notify the Owner's Project Manager in writing of any such difference.

c. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern for budgetary purposes. However, no work will proceed until the Project Manager determines the correct method of installation.

d. Applicable Codes and Standards shall include all State Laws, Local Ordinances, and Utility Company Regulations.

3. 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 standards governing the installation of underground fire mains, alarm valves, system drains, fire pump, etc.

b. Standpipe systems, and modifications to existing standpipe systems, for high rise buildings shall be designed to provide 100 PSIG residual pressure at the top-most remote flowing hose valve connection, in conformance with NFPA 14 and applicable state building code.

c. Hydraulic calculations for both standpipes and sprinkler systems shall be designed to include a 10 PSIG safety margin.

d. Sprinkler system design shall be based on the following information in Table 1 below and in accordance with NFPA 13 standards.

Table 1

AREA	NFPA 13 OCCUPANCY HAZARD	SPRINKLER SYSTEM HYDRAULIC CRITERIA	MAXIMUM PROTECTION AREA PER SPRINKLER	SYSTEM TYPE	NOTES
Offices, lounges, conference rooms, classrooms, separated dining areas, auditoriums, lobbies, toilet rooms, corridors, common areas, patient areas, etc.	Light	0.10 GPM/FT^2 over most remote 1,500 FT^2 + 250 GPM hose demand at municipal water source.	196 FT^2 in areas with finished ACT ceiling tiles. 225 FT^2 in areas with finished GWB ceilings.	Wet	Dining areas NOT separated from kitchens and serveries shall utilize Ordinary Hazard Group 1 criteria.
Laboratories, animal areas, support and adjoining spaces, and associated work, preparation and research areas.	Ordinary Hazard Group 1 for Laboratory Classes C and D per NFPA 45	0.15 GPM/FT^2 over most remote 1,500 FT^2 +250 GPM hose demand at municipal water source.	130 FT^2	Wet	The designer shall consult with the architect, code consultant and owner's project manager to determine the NFPA 45 lab class.
	Ordinary Hazard Group 2 for Laboratory Classes A and B per NFPA 45	0.20 GPM/FT^2 over most remote 1,500 FT^2 +250 GPM hose demand at municipal water source			

AREA	NFPA 13 OCCUPANCY HAZARD	SPRINKLER SYSTEM HYDRAULIC CRITERIA	MAXIMUM PROTECTION AREA PER SPRINKLER	SYSTEM TYPE	NOTES
Mechanical, electrical, Classes I to IV commodities storage, workshop and utility areas, glasswash, cagewash.	Ordinary Hazard Group 2	0.20 GPM/FT^2 over most remote 1,500 FT^2 +250 GPM hose demand at municipal water source.	130 FT^2	Wet	Storage less than 10 FT in height, and NOT rack storage. For other storage types, refer to NFPA 13 for specific criteria.
Kitchen and servery areas,	Ordinary Hazard Group 1	0.15 GPM/FT^2 over most remote 1,500 FT^2 +250 GPM hose demand at municipal water source.	130 FT^2	Wet	
Parking garages.	Ordinary Hazard Group 1	0.15 GPM/FT^2 over most remote 1,950 FT^2 +250 GPM hose demand at municipal water source.	130 FT^2	Dry	
Areas noted above, if subject to freezing.	Classifications as noted above.	Density as noted above, with 30% increase in area. Same hose demand.	130 FT^2	Dry	

AREA	NFPA 13 OCCUPANCY HAZARD	SPRINKLER SYSTEM HYDRAULIC CRITERIA	MAXIMUM PROTECTION AREA PER SPRINKLER	SYSTEM TYPE	NOTES
Specialty areas, high-value assets, server rooms, microscope rooms, archives, magnet areas, CT scan and other imaging areas.	Classifications as noted above for laboratories, research areas, etc.	Densities as noted above for laboratories, research areas, etc.	130 FT^2	Wet	1.The designer shall consult with the owner's project manager to determine whether or not the owner may desire to utilize any special suppression systems, such as pre-action sprinkler systems, Inergen, Novec, FM-200, etc. 2. The designer shall consult with the architect, code consultant and owner's project manager to determine the NFPA 45 lab class.

4. Hydraulic Calculations

    a. The designer shall provide a hydraulically designed system in complete accordance with and as defined in applicable National Fire Protection Standards.

    b. Verification of Hydraulic Information:

        i. The designer shall obtain current hydrant flow test or existing fire pump flow test information, and shall direct the contractor to perform hydrant flow tests, to establish water supply availability.

        ii. Water supply information shall be provided on in design documentation.

        iii. The designer shall confirm that hazard classifications/density requirements conform with the owner's insurance underwriter's requirements and those of other authorities having jurisdiction.

        iv. The designer shall confirm the presence or absence of existing fire pumps and obtain current test data for same.

        v. The designer shall make necessary field measurements of the existing fire protection system .

        vi. The designer must obtain current pump test results or request a new fire pump flow test in accordance with NFPA 20 to establish the performance of the existing fire pump.

    c. Design drawings and hydraulic calculations shall clearly describe and graph all water supply information.

    d. All calculations shall assume 10 PSI safety margin to allow for deterioration in static and residual pressures in the hydrant flow test and fire pump flow test results.

    e. Velocity shall not exceed 20 FPS unless approved by Owner.

    f. Hydraulic calculations shall include the hydraulically most remote area for each hazard classification/density requirements as noted on the contract documents.

    g. 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.

h. If new work is to be connected to existing piping the designer shall verify that the existing capability can support demands generated by the hydraulic calculations.

i. Hydraulic calculations submitted to owner's project manager shall be easily readable, in clear PDF format. All hydraulic reference points included in calculations shall be represented by corresponding and matching hydraulic reference points on drawings. Hydraulic reference points on drawings shall not be obscured or overwrite other graphics or text, nor be overwritten by other graphics or text. The designer shall provide the owner's project manager with any and all software needed in order to properly and completely view the hydraulic calculations and accompanying drawings. A site utility plan and riser diagram with hydraulic reference points shall also be included. The project manager shall direct the contractor to do the same.

j. The engineer of record shall review existing fire protection system hydraulic design placards, and identify existing hydraulic demands. If any renovation, addition or system modification work increases the hydraulic demands, new hydraulic design information placards, indicating the new increased hydraulic design demand information, shall be provided by the contractor.

5. Earthquake Protection and Seismic Restraints

a. The designer shall include direction in design documentation that the fire protection contractor must provide all necessary design and materials for seismic restraint and protection of piping and devices against damage where subject to earthquake as required by applicable code and NFPA 13, for the entire fire protection system within the building or renovation area. All isolation and seismic devices shall be the product of a single manufacturer. Isolation materials and seismic restraints shall be as manufactured by Mason Industries, Tolco or approved equal.

b. The designer shall provide direction in design documentation that the fire protection contractor must include the design, furnishing and installation of all
restraint devices and systems as may be required for the fire protection system, and the following specific submittal items.

c. Submittals shall include descriptive data for all products and materials, including the following:

i. Catalog cuts and data sheets for the specific isolators, restrains and all other items to be utilized.

ii. Details of methods of sleeving, fire protection, smoke proofing and isolation for pipes penetrating walls and slabs.

iii. Specific details of seismic restraints and anchors, including number, size and locations for each piece of equipment.

iv. Calculations to support seismic restraint designs.

v. All calculations, details and other submittal materials shall be sealed and signed by a Structural or Civil Engineer registered in Massachusetts and qualified to perform seismic design calculations.

vi. A seismic design liability insurance certificate that must accompany all submittals.

6. Temporary Protection, Impairments and Safeguarding

a. The designer shall provide the following direction in design documentation for implementation by the fire protection contractor, and general contractor/construction manager:

i. Safeguarding of the building during demolition, alteration and construction shall be a joint cooperative effort involving the entire project team, and primarily the fire protection contractor, the fire alarm contractor, the general contractor/construction manager, owner and all authorities having jurisdiction. The fire protection contractor and fire alarm contractor shall coordinate with any and all parties as appropriate in order to achieve proper safeguarding as described in the project documents.

ii. The contractors shall ensure proper building protection and safeguarding at all times during demolition, alteration, and construction in complete compliance with all applicable codes, regulations and standards.

iii. During times when the existing building fire protection systems are impaired, the contractors shall provide appropriate safeguarding of the renovation work area, and temporary heat detection or adequate alternate protection throughout the space, as coordinated with, and approved by, owner's fire prevention program manager, building manager, construction manager, insurance underwriters, and all authorities having jurisdiction.

iv. Safeguarding shall also apply to all related phasing, shut-downs, swing spaces, temporary services and facilities, relocations, etc. Alternative safeguarding such as, but not limited to, fire watch personnel, or temporary fire protection systems, may be considered if acceptable to the owner and authorities having jurisdiction. Refer to, and coordinate with, fire alarm systems documents, and any associated safeguarding and impairments notes and specifications. Coordinate with fire alarm system contractor and all other trades.

v. Provide (and include as shop drawings submittals) a complete demolition, alteration, construction, phasing and impairment plan to include the safeguarding information above, a schedule of project milestones and related work, and an anticipated schedule for installation, impairments, programming and all phases of final testing and completion of the work. This plan shall

be coordinated with all authorities having jurisdiction, the owner's fire prevention program manager, construction manager, and shall include any and all information, drawings, and graphics to meet the approval of the authorities having jurisdiction. The contractors shall provide firewatch personnel or temporary protection as required by any authorities having jurisdiction, the tenant/owner, or the tenant's/owners insurance underwriters.

vi. The above impairment plan shall be approved by all authorities,owner fire prevention program manager, tenant/owner insurance underwriters, etc., prior to any shutdowns or impairments.

7. Commissioning

a. The designer shall provide fully integrated design documents to ensure all required Contractors are fully responsible for supporting the Commissioning activities for the proposed systems to be commissioned.

b. The designer shall cooperate with the project Commissioning Agent, and be available for consult, site visits, meetings, etc. to provide the commissioning agent with information on systems' sequences of operation and testing requirements. The designer shall incorporate all systems' sequences of operation and testing requirements into the contract specifications.

8. 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 53 or Class 52, ANSI A21-51 with cement-mortar lining per ANSI A21.4. Fittings shall be ductile-iron 250 PSIG rating per ANSI A21.10 with cement-mortar lining per ANSI A21.4. Pipe Joints shall be AWWA C606 grooved end with Victaulic Style 31 couplings or 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 two (2) Dresser Style 38 Couplings and retainer clamps on the incoming water service. Connect to cement lined ductile iron site water main 10'-0" outside building foundation wall. Direct buried piping shall either be coated and wrapped or connected to a cathodic protection system.

c. Piping for sprinkler systems and standpipe systems shall be Schedule 40 black steel conforming to ASTM A53. If seamless piping is not used, then the seam shall be installed on the top of the pipe. Seamless piping shall be used wherever possible.

d. Piping for use with hole-cut fittings shall have shop fabricated 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. Torch cutting of the piping shall not be permitted.

e. Piping for use with grooved end fittings shall be roll grooved without metal removal or as per manufacture requirements. Cut grooved piping is acceptable for dry systems only.

f. 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 manufacturer

g. Standard black cast iron screwed fittings shall be used on piping 2" and smaller and may be used on larger sizes.

h. Sprinkler piping in areas subject to magnetic fields, i.e. MRI, NMRs, etc. shall be copper Type L, ASTM B88. Supported by stainless steel hangers and rods. Provide dielectric unions at transitions to copper piping.

i. If nitrogen is provided, black steel is acceptable; however, piping should be schedule 40 and cut grooved. Dry and Pre-action sprinkler piping and fittings shall be Schedule 40 galvanized steel. Dry and pre-action system piping shall be provided with corrosion monitoring devices similar to AGF CORRINSITE, Potter PCMPK Series, or Potter PCMS-RM.

j. Wet sprinkler system piping shall be provided with automatic air relief vents, at high points of the system and at floor control valve assemblies. Air relief vents shall be similar to Potter Model PAV, with strainer and a ball valve in-line immediately upstream to facilitate servicing or replacing the strainer or vent without disabling the sprinkler system.

k. Wet sprinkler system piping shall be provided with drains at low points of the system and at floor control valve assemblies.

l. At the ends of all sprinkler system main lines, provide 1” ball valves, and ¾” capped male hose threaded ends, to allow for periodic flushing. This should be piped to an acceptable location.

m. The designer shall obtain approval of the owner’s project manager for any alternative piping materials.

9. 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 these standards. 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. Beam Clamps: Carbon steel hanger with lock nut and retaining strap or approved equal.

f. Copper piping in areas subject to magnetic fields shall be supported by stainless steel hangers, rods and attachments.

g. Expansion= Anchors: Hilti HDI or approved equal.

h. 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.

i. Space hangers and supports for all fire protection system piping according to applicable NFPA standards.

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.

n. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded. Provide hanger rods sized according to NFPA standards.

o. Hangers, structure and associated components shall support the weight of five times the weight of the water filled pipe plus 250 pounds at the point of attachment.

10. Valves

a. All valves shall be installed in locations and orientations which are readily accessible for system service, maintenance, modifications, etc. Valves shall not be obstructed by, nor located above piping racks, cable trays, ducts, or other equipment. All system main shut-off / isolation valves shall be located in areas that are readily accessible without having to enter a locked room or program space. Provide access panels for valves where located above finished hard ceilings.

b. Pressure Reducing Valves

i. Pressure reducing valves shall be sized and located on the drawings and shall be field adjustable, pilot-operated, pressure reducing valve with pressure relief valve piped to drain riser. Provide 3” drain to allow for testing. Directing the pressure relief discharge piping to a floor drain within the room is not acceptable.

c. Shut-off and/or control valves shall be

i. Outside screw and yoke valve. Ductile iron or 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 hand wheel.

ii. 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.

iii. OS&Y Gate Valves shall be installed on all fire pump suction piping in accordance with NFPA 20.

iv. Provide supervised ball valves on sprinkler branch lines to all electric rooms and closets provided with wet sprinkler systems.

d. Check valves shall be:

i. Iron body, bronze mounted swing check with flanged ends, 2-1/2" in size up to 8" size; or

ii. Iron body, spring actuated, wafer check, sizes 4" through 8"; or

iii. Grooved end, ductile iron body, spring activated, sizes 2-1/2" through 12", suitable for vertical or horizontal installation

iv. All check valves up to 2" in size shall be all bronze with screwed ends.

e. Backflow Preventers

i. Double check valve assembly shall be ductile iron body, bronze mounted, flanged end with electrically supervised OS&Y, resilient wedge gate valves. Backflow prevention device and installation shall conform to requirements of local authorities and all Cross Connection Control Regulations

11. Sprinklers

a. All sprinklers shall be listed or approved as specified per Table 2, below. All sprinklers shall be of a single manufacturer, unless noted otherwise. Sprinklers shall be as manufactured by Tyco, Reliable, Viking, or Victaulic. Models noted in Table 2 below pertain to Tyco sprinklers for general reference information only, and specified sprinklers shall be similar. Sprinklers shall match existing manufacturer in the specific buildings or areas undergoing renovation.

b. Sprinklers shall be furnished and installed to conform to 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 areas without finished ceilings, in environmental rooms, and in mechanical rooms where damage is likely shall have sprinkler guards, wire gauge type that is listed to be used with the specified sprinkler.

e. Sprinklers shall be located in center of tiles.

f. Spare Sprinklers: Provide 20-gauge steel sprinkler cabinet with red enamel finish. Furnish the quantities of spare sprinklers for each type installed as required by NFPA 13. Furnish sprinkler wrench for each type of sprinkler installed. Mount cabinet in mechanical room or fire pump room, in an accessible location.

g. Sprinklers shall be similar to those specified in Table 2, below:

Table 2

LOCATION OR HAZARD TYPE	MFR. (Note 1)	MODEL (Note 1)	RESPONSE TYPE	SPRINKLER TYPE	K-FACTOR	FINISH TYPE	TEMPERATURE RATING (°F)	NOTES
Light Hazard areas with Ceilings	Tyco	Series RFII	Quick	Concealed Pendent	5.6	Pure White Cover Plate	139°F cover & 155°F	None
Light Hazard areas with ceilings	Tyco	Series TY-FRB	Quick	Recessed Pendent or Pendent	5.6	Chrome Plated	155°F	None
Light Hazard areas without ceilings	Tyco	Series TY-FRB	Quick	Upright	5.6	Natural Brass	155°F	None
Light Hazard areas with ceilings	Tyco	Series TY-FRL	Quick	Horizontal Sidewall	5.6	Chrome Plated	165°F	None
Labs, Storage Rooms and other Ordinary Hazard areas with ceilings	Tyco	Series TY-FRB	Quick	Recessed Pendent or Pendent	5.6	Chrome Plated	155°F	None
Ordinary Hazard areas without ceilings	Tyco	Series TY-FRB	Quick	Upright	5.6	Natural Brass	155°F	None
Cold rooms, loading docks and other cold areas with ceilings	Tyco	Series DS-1 & DSB-2	Quick	Dry Pendent with Dry Sprinkler Boot	5.6	Chrome Plated	155°F	Provide dry sprinkler boot at each sprinkler
Animal Holding Rooms or Vivarium areas with ceilings	Tyco	RAVEN Institutional	Quick	Institutional Pendent	5.6	Chrome Plated	165°F	Provide caulking around escutcheon
Glazing Requiring 2-hour protection	Tyco	Model WS	Quick	Pendent Vertical Sidewall or Horizontal Sidewall	5.6	Chrome Plated	155°F	Horizontal window mullions shall not be installed. Install per mfr's specifications.
Glasswash, cage and rack washers, autoclaves, and above kitchen cooking equipment	Tyco	Series TY-FRL	Quick	Pendent Or Upright	5.6	Chrome Plated	286°F	UL Glass bulb sprinklers shall not be used in food prep areas

LOCATION OR HAZARD TYPE	MFR. (Note 1)	MODEL (Note 1)	RESPONSE TYPE	SPRINKLER TYPE	K-FACTOR	FINISH TYPE	TEMPERATURE RATING (°F)	NOTES
MRI, CT, X-ray and other areas with magnetic fields	Reliable	Model F4FR-NF	Quick	Concealed Non-Ferrous Pendent	5.6	Pure White Cover Plate	135°F Cover Plate & 155°F Pendent	UL listed only

Notes:

1. Refer to Paragraph ‘a’ above.

12. Alarm valves

    a. Wet Pipe Alarm Valve

        i. 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 E3, Viking Model, J-1, Victaulic Series 751 or Tyco Model AV-1-300.

        ii. Valve trim shall include pressure activated electric alarm switches, flow switch, and electric alarm bell mounted to exterior of building.

    b. Dry Pipe Alarm Valve

        i. Dry pipe alarm valve shall be UL listed and FMG 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, similar to Tyco Model DPV-1.

        ii. Provide AGF CORRinSITE Model 7700, Schedule 40 galvanized, In-Line Spool and Mechanical Tee fittings throughout dry sprinkler distribution piping system. In-Line Spool and Mechanical Tee fittings shall be installed in accordance with AGF recommendations shall be installed so that each viewing window can easily be viewed and is not obstructed by other MEP/FP components or equipment, and shall be in an accessible location.

        iii. 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. For a tank-mounted air compressor, provide Flex Hose made of stainless steel to reduce vibration and noise transmitted through the piping system from the air compressor.

        iv. To accelerate operation of the dry valve, furnish and install Tyco VIZOR Electronic Dry Pipe Accelerator (EDPA) with 120V power supply. Accelerator shall be monitored for high/ low pressure and trouble by the building's fire alarm system.

    c. Pre-Action Sprinkler System

        i. Provide complete addressable UL-listed/FMG-approved, positive-supervised, single-interlocked cross-zoned, electrically actuated pre-action sprinkler system.

ii. Deluge Valve: Hydraulically operated differential diaphragm type, fully trimmed including electric actuator, air and water pressure gauges, low pressure warning switch, 2 inch main drain, pressure and fire alarm switch, and external reset. Similar to Tyco Model DV-5

iii. Control / Alarm / Release Panel: Addressable intelligent control panel with alarm, and solenoid circuitry, complete with 120 volt power supply, circuit breakers, battery charger, and batteries. Control panel shall be compatible with deluge valve, smoke and/or heat detectors and all system components. Similar to AUTOPULSE IQ-318.

iv. Fire Detection System: Provide a complete smoke sensing fire detection system at the ceiling above with smoke detectors installed and spaced in compliance with the manufacturer's specifications and NFPA 72. Similar to Notifier FSP-851 FlashScan photoelectric smoke detector; however, for consistency, JCI systems should be considered for compatibility with existing systems. Only if ambient conditions cause the use of smoke detectors to be unfeasible, such as generator rooms, provide complete heat sensing fire detection system at ceiling above with heat detectors installed and spaced in compliance with manufacturer's specifications and NFPA 72. Similar to Notifier FSP-851R FlashScan thermal/rate-of-rise heat detector. Refer to Section 28.

v. Sequence of Operation:

1. The piping system shall be supervised with low air pressure to detect damage to the piping system, or opened or damaged sprinklers. However a break, leak or opening of a sprinkler shall not open the deluge valve, nor cause water to discharge from the system in the absence of at least two detectors activations. A trouble alarm shall sound to indicate a piping leak without discharging water or flooding the system.

2. Operation of the first detector will operate local audible/visual devices and signal the Fire Alarm System. Deluge valve shall remain closed at this point.

3. Operation of any second detector in the protected space shall also signal the Fire Alarm System. Deluge valve shall open at this point.

4. Water will only flow from the sprinklers which activate due to heat at the individual sprinklers.

vi Detectors for MRI's, imaging spaces, and other areas with magnetic fields, electro-magnetic interference or radio frequency interference shall be

compatible with the environment and shall be configured to address the specific area equipment and environments. System and/or detectors shall not be subject to false alarms or trouble conditions due to magnetic reed switches or other componentry interacting with the magnetic fields or other environmental conditions. Detectors shall be provided with (1) appropriate components or shielding, coordinated with the equipment manufacturer, or (2) shall have the capability of disabling the magnetic reed switch, or (3) shall not be provided with a magnetic reed switch. All materials shall be compatible with the pre-action system control/alarm/release panel.

vii. Provide AGF CORRinSITE Model 7700, Schedule 40 galvanized, In-Line Spool and Mechanical Tee fittings throughout pre-action distribution piping system. In-Line Spool and Mechanical Tee fittings shall be installed in accordance with AGF recommendations shall be installed so that each viewing window can easily be viewed and is not obstructed by other MEP/FP components or equipment, and shall be in an accessible location.

13. Fire Department Hose Valves and Cabinets

a. Provide 2-1/2” fire department hose valves, similar to Croker 5035.

b. Wherever system pressures may exceed 175 PSIG, Fire Department valves shall be field adjustable pressure reducing type so that no valve is set for greater than 175 psig at outlet, similar to Croker 5410. The Contractor shall be responsible for locations of pressure reducing valves based upon a certified fire pump curve and hydraulic calculations.

c. Provide fire department hose valves cabinets where noted on the contract drawings. Cabinets shall be complete with 2-1/2” angle type valves and shall be fully recessed type similar to Croker 1710 or 1720, depending on type of hose valve selected.

14. Fire Department Inlet Connections

a. Surface or Flush Mounted: Polished chrome with escutcheon and two-way, three-way, or four-way connection, according to the fire protection system flow demands of the particular building. Each inlet shall have a clapper valve, and plastic cap with chain. Branding shall be: "Combination Standpipe and Sprinkler Systems" or “Standpipe” or “Auto Sprinkler” according to the systems(s) served. Connection shall be similar to Croker 6310, 6315 or 6320, depending on quantity of inlets needed.

b. Freestanding: Polished chrome with escutcheon and two-way, three-way, or four-way connection according to the fire protection system flow demands of the particular building. Each inlet shall have a clapper valve, and plastic cap with chain. Branding shall be: "Combination Standpipe and Sprinkler Systems" or “Standpipe” or “Auto Sprinkler” according to the systems(s) served. Connection shall be similar to Croker 6512, 6527 or 6530, depending on quantity of inlets needed.

15. Alarm devices

    a. Water Flow Switches

        i. 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.

        ii. Pressure type switch with two sets of double throw, single pole contacts with adequate pressure differential to prevent false operation, and 60 second time delay mechanism. Provide bleeder valve and pressure gauge, as necessary, to allow all pressure switches to be properly tested.

    b. Supervisory Tamper Switches

        i. OS&Y Gate Valves: Tamper switch with two contacts rated 10 Amp at 120 volts AC.

21 General installation requirements for sealing penetrations of electrical equipment

Penetrations: Whether pre-existing or created for new mechanical, electrical, plumbing or ventilation purposes, each penetration – **whether or not required by code** - should be sealed by an appropriate method that not only preserves the fire / smoke rating of the penetrated structure but also sustainably prevents the entry and passage of insect and rodent pests. Escutcheon plates are acceptable only if the penetration behind is first sealed. Weep holes in the building's exterior façade shall be protected by an insect- and rodent-resistant device or product that will permit flow of air and water. To exclude rodent and insect pests, penetrations in masonry may be packed with cement or grout. If firestopping compounds are used in masonry, wall board or other partitions, the openings might first be tightly packed, as practical, with non-oxidizing metal meshes such as stainless steel mesh pads (e.g. 'Xcluder' brand blocks or fabric) or copper mesh (e.g. 'Stuf-Fit' brand). Guidance on such product application is available from the Harvard University EH&S Senior Environmental Public Health Officer.