| DIVISION 21 | FIRE SUPPRESSION |
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# SECTION 21 00 00
# FIRE SUPPRESSION BASIC REQUIREMENTS

## PART 1 - GENERAL

### 1.01 DESIGN-BUILD SUMMARY OF WORK

A. Work included in 21 00 00 applies to Division 21, Fire Suppression work to provide materials, labor, tools, permits and incidentals to make fire suppression systems ready for Owner's use for proposed project.

### 1.02 DESIGN-BUILD INSTRUCTIONS

A. This document is issued to give Bidders a basis for preparing a proposal to design and install a complete Fire Suppression system for this project.

B. Alternates to this Document may be offered as a separate proposal.

### 1.03 DESIGN-BUILD DESIGN APPROACH

A. Use this Specification as a guide for design/engineering requirements, workmanship and materials or construction. Utilize design-build concept throughout construction phase of project.

B. Investigate and be apprised of applicable codes, rules, and regulations as enforced by AHJ.

C. Visit the Site of the proposed construction. Verify and inspect the existing site to determine conditions that affect this work.

### 1.04 DESIGN-BUILD DESIGN CRITERIA/CALCULATIONS

A. Related Work Specified Elsewhere:
   1. Contents of Section apply to Division 21, Fire Suppression Specifications.
   2. Requirements of Section are a minimum for Division 21, Fire Suppression Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.

B. Fire Suppression Design Criteria: Refer to individual Division 21, Fire Suppression Sections for fire suppression system design criteria.

C. Fire Suppression Equipment: Refer to individual Division 21, Fire Suppression Sections for fire suppression equipment requirements.

### 1.05 SECTION INCLUDES

A. Work included in 21 00 00, Fire Suppression Basic Requirements applies to Division 21, Fire Suppression work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of fire protection systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:
   1. Provide: To furnish and install, complete and ready for intended use.
   2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
   3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete Item of work furnished.
   4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent," substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted Item.

5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's representative, and other reviewing entity whose approval is required to obtain systems acceptance.

## 1.06 RELATED SECTIONS

A. Content of Section applies to Division 21, Fire Suppression Contract Documents.

B. Related Work:
   1. Additional conditions apply to this Division including, but not limited to:
      a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
      b. Drawings
      c. Addenda
      d. Owner/Architect Agreement
      e. Owner/Contractor Agreement
      f. Codes, Standards, Public Ordinances and Permits

## 1.07 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 21, Fire Suppression Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
   1. State of Oregon:
      a. OAR - Oregon Administrative Rules
      b. OESC - Oregon Electrical Specialty Code
      c. OFC - Oregon Fire Code
      d. OMSC - Oregon Mechanical Specialty Code
      e. OPSC - Oregon Plumbing Specialty Code
      f. OSSC - Oregon Structural Specialty Code
      g. OEESC - Oregon Energy Efficiency Specialty Code
      h. Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
   1. ABA - Architectural Barriers Act
   2. ADA - Americans with Disabilities Act
   3. AHRI - Air-Conditioning Heating & Refrigeration Institute
   4. ANSI - American National Standards Institute
   5. ASCE - American Society of Civil Engineers
   6. ASCE-7 Minimum Design Loads for Buildings and Other Structures
   7. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers
   8. ASHRAE Guideline 0, the Commissioning Process
   9. ASME - American Society of Mechanical Engineers
   10. ASPE - American Society of Plumbing Engineers
   11. ASSE - American Society of Sanitary Engineering
   12. ASTM - ASTM International
   13. AWWA - American Water Works Association
   14. CFR - Code of Federal Regulations
   15. EPA - Environmental Protection Agency
   16. ETL - Electrical Testing Laboratories
   17. FCC - Federal Communications Commission
   18. FM - FM Global
   19. FM Global - FM Global Approval Guide
   20. IAPMO - International Association of Plumbing and Mechanical Official
   21. ICC - International Code Council

22. IEC - International Electrotechnical Commission
23. ICC-ESR - International Code Council Evaluation Service Reports
24. HI - Hydraulic Institute Standards
25. ISO - International Organization for Standardization
26. MSS - Manufacturers Standardization Society
27. NEC - National Electric Code
28. NEMA - National Electrical Manufacturers Association
29. NFPA - National Fire Protection Association:
    a. NFPA 13 - Standard for the Installation of Sprinkler Systems
    b. NFPA 25 - Standard for Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
    c. NFPA 70 - National Electrical Code
    d. NFPA 72 - National Fire Alarm and Signaling Code
30. NRCA - National Roofing Contractors Association
31. NSF - National Sanitation Foundation
32. OSHA - Occupational Safety and Health Administration
33. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
34. TIMA - Thermal Insulation Manufacturers Association
35. UL - Underwriters Laboratories Inc.

D. See Division 21, Fire Suppression individual Sections for additional references.

E. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

F. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

G. Piping Insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

**1.08 SUBMITTALS**

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 21, Fire Suppression sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

D. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one zip file per specification division containing a separate file for each Specification Section. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.

E. Submit shop drawings, calculations and product data sheets as one complete stand-alone package to AHJ, Owner's insurance underwriter and Engineer.

F. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 21, Fire Suppression Sections.

G. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
   1. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed Item. Highlight connections by/to other trades.
   2. Include technical data, installation instructions and dimensioned drawings for products, equipment and devices installed, furnished or provided. Reference Division 21, Fire Suppression specification Sections for specific Item required in product data submittal outside of these requirements.
   3. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
   4. For vibration isolation of equipment, list make and model selected with operating load and deflection. Indicate frame type where required. Submit manufacturer's product data.
   5. See Division 21, Fire Suppression Sections for additional submittal requirements outside of these requirements.

H. Maximum of two reviews provided of complete submittal package. Arrange for additional reviews and/or early review of long-lead Item; Bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

I. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer's comments. Identify Engineer's comments and provide an individual response to each of the Engineer's comments. Cloud changes in the submittals and further identify changes which are in response to Engineer's comments.

J. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-10 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.

K. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 21, Fire Suppression coordination documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical and Division 28, Electronic Safety and Security submittals.

L. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

M. Substitutions and Variation from Basis of Design:
   1. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
   2. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of

"Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

N. Shop Drawings:
1. Provide coordinated Shop Drawings which include physical characteristics of all systems, equipment and piping layout, pipe layout, hanger layout, sway brace layout, seismic restraints, sway brace calculations, drains, location of drain discharge, risers, valves, details, water test information, physical device layout plans, and control wiring diagrams. Reference individual Division 21, Fire Suppression Sections for additional requirements for shop drawings outside of these requirements.
2. Shop Drawings and hydraulics calculations, sway brace calculations, trapeze hanger calculations, and the like, to be prepared under the direct supervision and control of a Professional Engineer competent to do such work and licensed in the state of Oregon. Drawings and calculations to bear the seal and wet signature of the professional Engineer.
3. Provide Shop Drawings which indicate information required by NFPA 13. Include room names and fire sprinkler occupancy hazard classifications.
4. Provide Shop Drawings illustrating information for Hydraulic Information Sign for each hydraulic remote area calculated.
5. Utilizing the Reflected Ceiling backgrounds, provide Shop Drawings illustrating locations of fire sprinklers and piping.
6. Utilizing the Structural backgrounds, provide Shop Drawings illustrating locations and types of hangers and sway braces.
7. Provide Shop Drawings illustrating each type of hanger, including fasteners to structure.
8. Provide Shop Drawings illustrating each type of branchline restraint and sway brace, including length of sway brace member, sway brace fittings, minimum and maximum angles from vertical of sway brace member, method of attachment to structure, size, length and embedment of attachment to structure and size and type of structural member to which sway brace will be attached. Number each type of restraint and sway brace. Indicate on Drawings locations of each type of numbered restraint and sway brace.
9. Provide details for any hanger, attachment, or sway brace to be attached to any I-joist, structural insulated panels (SIPs), cross laminated timber, and similar engineered structural products according to the specifications of the engineered product manufacturer.
10. Provide Shop Drawings illustrating information for Sprinkler System General Information Sign.
11. Shop Drawings to include a cross-sectional view that shows the sprinkler heads and piping in relation to the building's architectural and structural information. View to be chosen based on a location that will display the most information.
12. When required, provide Coordination Drawings.
13. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
14. Provide details of hanger, sway bracing and branch line restraint attachments to structure and to piping. Include details on the size and load capacities of fasteners. Provide verification of the structural capacity to withstand seismic load.
15. Provide sway bracing calculations on drawings showing horizontal seismic design load and requirements, with indication of zone of influence for each bracing location.
16. Provide a schedule of sway bracing type, size, and design criteria, including length, angle from vertical, and load capacities.
17. Clearly indicate the elevation of the highest sprinkler in relation to the elevation of the flow test pressure gauge monitor hydrant.
18. Provide details of flexible sprinkler hose fitting per manufacturer's schedule of equivalent feet used in hydraulic calculations, showing device length, maximum number of 90-degree bends and expected radius of bends.
19. Provide a schedule of signage to be installed at each flexible sprinkler hose fitting.
20. On the drawings, provide a list of number, model, temperature, sprinkler Identification number, manufacturer, orifice, deflector type, thermal sensitivity and pressure rating,

quantity of each type to be contained in the spare sprinkler cabinet and the issue date or revision date of the list."

21. Spare sprinkler head cabinet size indicating the number of spare sprinkler head to be contained therein.

O. Samples: Provide samples when requested by individual Sections.

P. Resubmission Requirements:
   1. Make any corrections or change in submittals when required. Provide submittals as specified. The Engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Clearly indicate changes on Drawings and cloud changes in the submittals.
   2. Resubmit for review until review indicates no exceptions taken or make "corrections as noted".

Q. Operation and Maintenance Manuals/Owners Instructions:
   1. Submit, at one time, electronic files (PDF format) on CD/DVD of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or Item requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
      a. Include copies of certificates of code authority acceptance, code-required acceptance tests; test reports and certificates.
      b. Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Sections.
      c. Catalog description of each Item of equipment actually installed on job.
      d. Instructions for operation and maintenance of fire suppression systems composed of operating instructions, maintenance instructions and manufacturer's literature as follows:
         1) Testing and Maintenance Schedule Chart: Provide an 8-1/2- by 11-inch typewritten list of each item of installed equipment requiring testing inspection , lubrication or service, describing and scheduling performance of maintenance.
         2) Manufacturer's Literature: Provide copies of manufacturer's instructions for operation and maintenance of fire suppression equipment, including replacement parts list with name and address of nearest distributor. Mark each copy with equipment identification label as listed in equipment schedule, i.e. F-5 etc.
      e. Include product certificates of warranties and guarantees.
      f. Include Record Drawings,
      g. Include copy of water supply flow test used as basis for hydraulic calculations.
      h. Include hydraulic calculations and sway brace calculations.
      i. Include Contractor's Material and Test Certificates for Aboveground Piping/Underground Piping.
      j. Include a copy of NFPA 25.
      k. Include a copy of valve charts and whether normally open or normally closed.
      l. Include a copy of drain, auxiliary, and low point drains charts.
      m. Include a copy of the list to be included in the spare sprinkler head box.
      n. Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
      o. Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine

maintenance parts, including part numbers, sizes, and quantities relevant to each piece of equipment: i.e. belts, motors, lubricants, and filters.

p. Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.

q. Include copy of startup and test reports specific to each piece of equipment.

r. Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

2. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 21 00 00, Fire Suppression Basic Requirements, Article titled "Demonstration".

3. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

R. Record Drawings:

1. Maintain at site at least one set of Drawings for recording "As-constructed" conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical Item. Include items changed by field orders, supplemental instructions, and constructed conditions.

2. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.

3. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD disk and drawings upon substantial completion.

4. Invert elevations and dimensioned locations for water services and drainage piping below grade extending to 5-feet outside building line.

5. Record Drawings to include site information or reference site information for complete understanding of the fire protection system between the building and the point of connection to the water supply and location of flow test pressure hydrants.

6. See Division 21, Fire Suppression individual Sections for additional items to include in Record Drawings.

S. Calculations: Submit hydraulic and sway brace and the like calculations.

1. Hydraulic Calculations:

a. Include friction losses between the hydraulically most remote design area and the hydrant flow test pressure hydrant.

b. Hydraulic calculations to be performed on a nationally recognized fire sprinkler hydraulic calculation computer program, with cover sheets in the format required by the latest edition of NFPA 13. Hydraulic calculations performed "by hand" or not on a nationally recognized fire sprinkler hydraulic calculations computer program will be returned without review by engineer.

c. Provide one or more hydraulic calculations for each hydraulically most remote area.

d. Where it is not obvious which area is most hydraulically remote, perform and submit for review additional hydraulic calculations proving the hydraulically most remote area.

e. For grid systems, either provide "peaked" hydraulic calculations, or provide two additional sets of hydraulic calculations for each hydraulically most remote area.

f. Include pressure losses between the highest sprinkler and the elevation of the pressure gauge monitor hydrant of the flow test.

g. Include friction loss for flexible branch line connectors per manufacturer's schedule of equivalent feet for device length, maximum number of bends and expected radius of bends.

h. When flexible sprinkler hose fittings are added to an existing system, provide hydraulic calculations verifying the design flow rate will be achieved."

i. For Future Tenant Improvement Spaces: Include in hydraulic calculations friction loss allowances for future installation of flexible sprinkler head connectors so that flexible connectors may be installed in the future without revisions to the overhead system.

2. Sway Brace Calculations:
   a. Sway brace calculations utilizing a proprietary computer calculation program only used for the sway brace components supported by that manufacturer. For example, only "manufacturer X" sway brace components, and not those of another manufacturer, may be calculated on a "manufacturer X" sway brace computer calculation program.
   b. Provide seismic calculations for any sway brace to be attached to any I-joist, structural insulated panels (SIPs), cross laminated timber, and similar engineered structural products according to the specifications of the I-joist manufacturer.

## 1.09 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State, Federal and other applicable laws and regulations.

B. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every Item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

C. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

D. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

E. Provide products that are UL listed.

## 1.10 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

## 1.11 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, plumbing equipment/fixtures, fire sprinklers, fire alarm, plumbing, cable trays, lights, and electrical services with architectural and structural requirements, and other trades (including fire alarm ceiling suspension and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, and finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in the event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation.

D. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

A. Provide like Item from one manufacturer, including but not limited to sprinkler heads, pipe, fittings, hangers and bracing materials.

### 2.02 MATERIALS

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL and FM approved for their intended fire protection function or have adequate approval or be acceptable by State, County, and City authorities.

B. Articles, fixtures and equipment of a kind to be standard product of one manufacturer.

C. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

D. Hazardous Materials:
   1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
   2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
   3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

### 2.03 ACCESS PANELS

A. See Division 01, General Requirements and Division 08, Openings for products and installation requirements.

B. Confirm Access Panel requirements in Division 01, General Requirements, Division 08, Openings and individual Division 21, Fire Suppression Sections. In absence of specific requirements, comply with the following:
   1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly.
      a. Ceiling access panels to be minimum of 24-inch by 24-inch required and approved size.
      b. Wall access panels to be minimum of 12-inch by 12-inch required and approved size.
      c. Provide two keys for each set of keyed cylinder type locks.
      d. Manufacturers and Models:
         1) Drywall: Karp KDW.
         2) Plaster: Karp DSC-214PL.
         3) Masonry: Karp DSC-214M.
         4) 2 hour rated: Karp KPF-350FR.
         5) Manufacturers: Karp, Milcor, Elmdor, Acudor or approved equivalent.

## PART 3 - EXECUTION

### 3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Install equipment requiring access (i.e. drains, control operators, valves, motors, engines, pumps, controllers, air compressors, gauges, fill cups, tanks, cleanouts and the like) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Earthwork:
   1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with the following:
      a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with the provisions specified. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
      b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
      c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:
   1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:
      a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM International E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Pipe Installation:
   1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating coordinating installation of piping systems.
   2. Include provisions for servicing and removal of equipment without dismantling piping.

G. Plenums: Provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

**3.02 SEISMIC CONTROL**

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 21, Fire Suppression Sections.

B. Provide fire suppression equipment and piping, both hanging and base mounted, with mounting connection points of sufficient strength to resist lateral seismic forces equal to lateral seismic forces as determined by building code and NFPA 13 calculations, whichever is more demanding.

C. See Structural Drawings for seismic design criteria for sway bracing and seismic restraint.

D. Earthquake resistant designs for Fire Protection (Division 21) equipment and distribution, i.e. fire sprinkler systems, fire standpipe systems, fire pumps, fire pump controllers, fire tanks, clean agent fire suppression systems, etc. to conform to regulations of jurisdiction having authority.

E. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and

equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

F. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping, equipment, tanks, pumps controllers and the like. Submit shop drawings along with equipment submittals.

G. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

H. Provide details of flexible drops for sprinklers in conformance with Building Code and ASCE 7 requirements of ceilings. Coordinate with Architectural and Structural Drawings and Specifications.

I. Piping: Per NFPA 13, ASCE-7 and local requirements.

J. Equipment:
   1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA, ASCE 7 and local requirements.
   2. Provide means to prohibit excessive motion of fire protection equipment during an earthquake.

**3.03 REVIEW AND OBSERVATION**

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
   1. Underground piping installation prior to backfilling.
   2. Prior to covering walls.
   3. Prior to ceiling cover/installation.
   4. When main systems, or portions of, are being tested and ready for inspection by AHJ.
   5. When mains or branchlines are to be permanently concealed by construction or insulation systems.
   6. When fire suppression systems, or portions of, are being tested and ready for inspection by AHJ.

C. Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system. If Contractor fails to notify Architect at times prescribed above, costs incurred by removal of such work are the responsibility of the Contractor.

D. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

**3.04 CUTTING AND PATCHING**

A. Confirm Cutting and Patching requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:
   1. Cutting and patching performed under Division 21, Fire Suppression includes, but is not limited to:
      a. Cutting and patching of plaster or partitions.
      b. Cutting and patching of finished ceilings.
   2. Perform cutting and patching by skilled craftsmen in trade of work to be performed. Fill holes which are cut oversized for completed work. Match refinished areas with existing adjacent finish in a manner acceptable to Architect.
   3. When masonry to concrete construction must be penetrated, provide a steel pipe sleeve in opening and grout in place in a neat manner. Leave grout surface to match existing finish. Provide escutcheons. If sleeves are not provided, core drill penetrations.

4. Locate concealed utilities to eliminate possible service interruption or damage.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.
6. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
7. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
8. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
9. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, landscaping, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
10. Repair mutilation of building around pipes, equipment, hangers, and braces.

**3.05 EQUIPMENT SELECTION AND SERVICEABILITY**

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing at no additional cost to Owner.

**3.06 DELIVERY, STORAGE AND HANDLING**

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:
   1. Handle materials delivered to project site with care to avoid damage and deterioration. Store materials in original containers which identify manufacturer, name, brand and model numbers on site inside building or protected from weather, sun, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.
   2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
   3. Protect bright finished shafts, bearing housings and similar Item until in service.

**3.07 DEMONSTRATION**

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with

requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

D. Prior to acceptance of work and during time designated by Architect, provide necessary qualified personnel to operate system for a period of two hours.

E. Instruct the Owner in the operation of the sprinkler system, including main valve position (open or closed) recognition, system drainage, system testing, dry pipe valve reset and the relation to the fire alarm system.

F. Upon completion of work and adjustment of equipment, test systems to demonstrate to Owner's Representative and Architect that equipment is furnished and installed or connected under provisions of these Specifications.

**3.08 CLEANING**

A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of installation, except for sprinklers, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

C. Sprinklers may not be cleaned except for vacuuming in a manner in which no part of the sprinkler is touched by the vacuuming equipment. Replace sprinklers which bear traces of foreign substances with sprinklers of same model, temperature, K-factor, orifice, finish, style, orientation, and the like.

**3.09 INSTALLATION**

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Install equipment in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start-up equipment, in accordance with manufacturer's start-up instructions, in the presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. Provide pump impellers to obtain Basis of Design design capacities.

D. Provide miscellaneous supports/metals required for installation of equipment and piping.

**3.10 PAINTING**

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 21, Fire Suppression Sections and the following:

1. Ferrous Metal: After completion of fire protection work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
2. After acceptance by Authority Having Jurisdiction (AHJ), in a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
3. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
4. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
5. Covers: Covers such as vault covers and the like will be furnished with finishes which resist corrosion and rust.

## 3.11 DEMOLITION

A. Confirm Demolition requirements in Division 01, General Requirements and Division 02, Existing Conditions. In absence of specific requirements, comply with individual Sections in Division 21, Fire Suppression and the following:
   1. Scope:
      a. It is the intent of these documents to provide necessary information and adjustments to fire protection system required to meet code, and accommodate installation of new work.
      b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
      c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged Item with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
   2. Equipment and Piping: Unless otherwise directed, equipment, piping, or fittings being removed as part of demolition process are Owner's property. Remove other Item not scheduled to be reused or relocated from job site as directed by Owner.
   3. Unless specifically indicated on Drawings, remove exposed, unused piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap piping and patch surfaces to match surrounding finish.
   4. Unless specifically indicated on Drawings, remove unused equipment, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).
   5. Coordinate demolition of existing fire suppression systems with Contractor. Where applicable or possible, portions of fire suppression demolition work may be performed by Contractor. Verify with local AHJ as to limitations of demolition by others and not fire suppression trades. Coordinate extent of demolition of fire suppression work to be done by others and supervise this work. No extra costs will be approved by replacement of systems due to improper or excessive demolition.

## 3.12 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Sections in Division 21, Fire Suppression and the following:
   1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
      a. Testing reports including Contractor's Material and Test Certificate for Underground Piping, Contractor's Material and Test Certificate for Aboveground Piping, Contractor's Material and Test Certificate for Private Fire Service Mains, Fire pump acceptance test data report, and the like.
      b. Cleaning
      c. Operation and Maintenance Manuals
      d. Training of Operating Personnel
      e. Record Drawings
      f. Warranty and Guaranty Certificates
      g. Start-up/Test Document and Commissioning Reports
      h. Letter of Conformance

## 3.13 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 21 00 00, Fire Suppression Basic Requirements and individual Division 21, Fire Suppression Sections.

B. Upon completion of installation of equipment, sprinklers, hose valves and piping and after units are water pressurized, test system to demonstrate capability and compliance with requirements. When possible, correct malfunctioning Item at site, then retest to demonstrate compliance; otherwise remove and replace with new Item and proceed with retesting.

C. Inspect each installed Item for damage to finish. If feasible, restore and match finish to original, except fire sprinklers, at site; otherwise, remove Item and replace with new Item. Feasibility and match to be judged by Architect. Remove cracked or dented Item and replace with new Item.

D. Fire sprinklers may not be reused, or cleaned, except for dusting. Replace damaged, field painted, oversprayed, overcoated or field coated sprinklers with new sprinklers of same manufacturer, model, finish, K-factor and performance characteristics. Where identical replacement sprinklers are not available, provide sprinklers of similar finish, style, K-factor and performance characteristics.

**3.14 LETTER OF CONFORMANCE**

A. Provide Letter of Conformance and copies of manufacturers' warranties and extended warranties with a statement that fire suppression items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

**3.15 ELECTRICAL INTERLOCKS**

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize fire protection equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

**3.16 CONNECTIONS TO EXISTING**

A. Prior to connection of piping to existing piping or utilities, field verify existing conditions and exact sizes and locations of existing piping. Provide additional offsets, transitions, joints, cut-ins, and replace portions of existing as required to facilitate connections of new.

**END OF SECTION**

# SECTION 21 05 00
# COMMON WORK RESULTS FOR FIRE SUPPRESSION

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Work Included:
   1. Aboveground Black Steel Pipe and Fittings
   2. Wall and Floor Penetrations and Sleeves
   3. Switches, Valve Supervisory
   4. Switches, Water Detector
   5. Hangers and Supports
   6. Struts and Strut Clamps
   7. Sway Braces and Restraints
   8. Anchors and Attachments
   9. Gauges
   10. Bells
   11. Fire Department Connection
   12. Valves
   13. Pipe Valve and Fire Protection Equipment Identification
   14. Signs
   15. Drains

### 1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Division 22, Plumbing
   2. Division 23, Heating, Ventilating and Air Conditioning
   3. Division 26, Electrical
   4. Division 28, Electronic Safety and Security
   5. Division 31, Earthwork
   6. Section 21 00 00, Fire Suppression Basic Requirements
   7. Section 21 13 00, Fire Suppression Sprinkler Systems

### 1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. Meet requirements of ASCE 7, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers, latest adopted edition.

### 1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. Provide seismic calculations for any sway brace to be attached to any I-joist according to the specifications of the I-joist manufacturer.

### 1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:
   1. Material and Equipment: Listed for its intended fire protection use in current UL Fire Protection Equipment Directory, or UL Online Certifications Directory for Fire Protection, International Code Council Evaluation Service Reports or FM Global Approval Guide, new and of current manufacture.

2. Provide per AHJ requirements.
3. References to product Specifications for materials are listed according to accepted ANSI, ASTM, ASME, AWWA and other base standards. Materials to meet latest approved versions of these standards.
4. See Section 21 00 00, Fire Suppression Basic Requirements where piping materials are approved for use.
5. Fire Suppression Screw-Thread Connections: Comply with local fire department/fire marshal regulations for sizes, threading and arrangement of connections for fire department equipment to fire department connections.
6. Manufacturers: Unless an item is marked "No substitutions", submit substitution request for materials of other than named manufacturers.
7. Noise and Vibration:
   a. Install vibration isolators and measures required to prevent noise and vibration from being transmitted to occupied areas. Select equipment to operate within noise coefficient (NC) design level for particular type of installation in relation to its location.
   b. After installation, make proper adjustments to reduce noise and vibration to acceptable levels as defined by Architect.
   c. In acoustically sensitive areas, design system in a manner that minimizes the number of wall penetrations.

**1.06 WARRANTY**

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

**1.07 FLOW TEST**

A. General:
   1. Flow test information is provided for design of NFPA 13 sprinkler and/or NFPA 14 standpipe systems if conducted within 12 months prior to working plan submittal. If information below is older than 12 months, then information below is advisory only and not to be used for design. Provide materials and labor for a new water supply test on the closest nearby fire hydrants per NFPA 13 and NFPA 291, if test information below is older than 12 months. Base hydraulic calculations on new flow test.

B. Flow Test:
   1. Flow: _____ GPM at a residual pressure of _____ PSI.
   2. Static Pressure: _____ PSI.
   3. Location: _____.
   4. Elevation: _____.
   5. Date: _____.
   6. Information Provided By: _____.

**1.08 SYSTEM IMPAIRMENT**

A. When returning a water-based fire protection system to service after impairment or control valve closure, verify the system is in working order by performing a main drain test per NFPA 25.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

A. Aboveground Black Steel Pipe and Fittings:
   1. Pipe:
      a. Bull Moose Tube
      b. Wheatland Tube Company
      c. Youngstown Tube Company
      d. Tex-Tube Company
      e. State Pipe and Supply, Incorporated
      f. Or approved equivalent
   2. Fittings, Mechanical and Grooved Couplings:
      a. Victaulic

b. Gruvlok
c. Shurjoint Piping Products Incorporated
d. Smith-Cooper International
e. Tyco Fire & Building Products
f. Viking Corporation
g. Allied Rubber and Gasket Company Incorporated, dba ARGCO
h. Anvil International
i. Dixon Valve & Coupling
j. Or approved equivalent.

3. Fittings, Threaded:
   a. Ward Manufacturing
   b. Anvil International
   c. Smith-Cooper International
   d. Aegis Technologies
   e. Or approved equivalent.
4. Fittings, Rubber Gasketed:
   a. Victaulic
   b. Anvil International
   c. AnvilStar
   d. EBAA Iron, Incorporated
   e. Shurjoint Piping Products, Incorporated
   f. Smith-Cooper International
   g. Tyco Fire & Building Products
   h. Viking Corporation
   i. Ward Manufacturing
   j. Allied Rubber and Gasket Company Incorporated, dba ARGCO
   k. Dixon Valve & Coupling
   l. Or approved equivalent.
5. Fittings, Welded:
   a. Anvil International
   b. Shurjoint Piping Products Incorporated
   c. Smith-Cooper International
   d. State Pipe & Supply, Incorporated
   e. Or approved equivalent.
6. Fittings, Flanged:
   a. Victaulic; Groove/Flange Adapter.
   b. United Brand Fittings
   c. U.S. Pipe
   d. Anvil S.P.F.
   e. Iowa Fittings Company
   f. Tyco Fire Products; Grinnell Groove/Flange Adapter
   g. Or approved equivalent.

B. Wall and Floor Penetrations and Sleeves:
   1. Allied Rubber and Gasket Company, Incorporated, dba ARGCO
   2. Fire Protection Products Incorporated (FPPI)
   3. Or approved equivalent.

C. Switches, Valve Supervisory:
   1. Outside Screw and Yoke Valve Supervisory Switch:
      a. Potter Electric Signal Company; Model OSYSU-1, -2.
      b. System Sensor; Model OSY2 or OSYECP.
      c. Or approved equivalent.
   2. Post Indicator Valve (PIV) Control Valve Supervisory Switch:
      a. Potter Electric Signal Company; Model PCVS-1, -2.

b. System Sensor; Model PIVB2 or PIVBEXP.
c. Or approved equivalent.

3. Non-Rising Stem Valve Supervisory Switch:
   a. Potter Electric Signal Company; Model PTS-C.
   b. System Sensor; Model PSP1.
   c. Or approved equivalent.
4. Ball Valve Supervisory Switch:
   a. Potter Electric Signal Company; Model RBVS.
   b. System Sensor; Model PSP1.
   c. Or approved equivalent.
5. Angle Valve Supervisory Switch:
   a. System Sensor; Model PSP1.
   b. Or approved equivalent.

D. Switches, Water Detector:
1. Water Flow Switches:
   a. Wet Sprinkler Systems:
      1) Potter Electric Signal Company; Model VSR.
      2) System Sensor; Model WFD.
      3) Or approved equivalent.
2. Pressure Operated Alarm Switches:
   a. Dry Pipe Sprinkler Systems:
      1) Detection of Water Flow:
         (a) Potter Electric Signal Company; Model PS10.
         (b) System Sensor; Model EPS or EPS EXT.
         (c) Or approved equivalent.
      2) Detection of Low Pressure:
         (a) Potter Electric Signal Company; Model PS40.
         (b) System Sensor; Model EPS or EPS EXP.
         (c) Or approved equivalent.

E. Hangers and Supports:
1. Cooper B-Line Tolco:
   a. Ring Hangers:
      1) Model B3100, Figure 2000.
      2) Model B3100, Figure 2.
   b. U-Bolts: Model B3188.
   c. Straps:
      1) Figure 22.
      2) Figure 22L2.
      3) Figure 23.
      4) Figure 24.
      5) Figure 28.
      6) Figure 29.
      7) Model B3184.
   d. Riser Clamps: Model B3373.
   e. Pipe Clamps: Model B3140, Figure 4B.
2. Automatic Fire Control Incorporated, dba Afcon.
3. Anvil International
4. ITW Buildex Sammys
5. Erico International
6. PHD Manufacturing Incorporated
7. Or approved equivalent.

F. Struts and Strut Clamps:
1. Struts:

a. Cooper B-Line Tolco
b. Or approved equivalent.

2. Strut Clamps:
a. Cooper B-Line Tolco; Model B2400.
b. Or approved equivalent.

G. Sway Braces and Restraints:
1. Cooper B-Line Tolco:
a. Fig. 75
b. Fig. 4A
c. Fig. 4L
d. Fig. 4LA
e. Fig. 800
f. Fig. 825
g. Fig. 825A
h. Fig. 828
i. Fig. 906
j. Fig. 910
k. Fig. 975
l. Fig. 980
m. Fig. 1000
n. Fig. 1001
o. Fig. 2002
2. Automatic Fire Control Incorporated, dba Afcon.
3. Anvil International
4. Erico International
5. PHD Manufacturing Incorporated
6. Or approved equivalent.

H. Anchors and Attachments:
1. Concrete:
a. Cast-In Place Anchors for Hangers:
1) Cooper B-Line Tolco; Models 109, 109AF, B2500 with N2500 nut, or B3014 with B3014N nut.
2) Automatic Fire Control Incorporated, dba Afcon.
3) Erico International
4) Or approved equivalent.
b. Cast-In Place Anchors for Braces:
1) Cooper B-Line Tolco; Models B2500 with N2500 nut, or B3014 with B3014N nut.
2) Anvil International; Figure 282 with nut.
3) Automatic Fire Control Incorporated, dba Afcon.
4) Erico International
5) Or approved equivalent.
c. Attachments as specified or described by structural. If not specified or described by structural, then as follows:
1) Hilti; Model Kwikbolt TZ
2) Powers; Models Snake+, Power Stud+ SD2, or Powers Wedge-Bolt.
3) Simpson Strong-Tie
4) Or approved equivalent.
2. Wood:
a. Cooper B-Line Tolco:
1) Fig. 5D
2) Fig. 51
3) Fig. 56
4) Fig. 58

5) Fig. 78
6) Fig. 120
7) Fig. 130

b. Automatic Fire Control Incorporated, dba Afcon.
c. Anvil International
d. Erico International
e. ITW Buildex Sammys
f. Or approved equivalent.

3. Steel:
a. Cooper B-Line Tolco:
1) Model B3037
2) Model B3033
3) Model B3034
4) Fig. 65
5) Fig. 66
6) Fig. 67
7) Fig. 68
8) Fig. 69
9) Model B3042T
10) Fig. 22L2
11) Fig. 23
12) Fig. 24
13) Fig. 28
14) Fig. 78

b. Automatic Fire Control Incorporated, dba Afcon.
c. Anvil International
d. Erico International
e. ITW Buildex Sammys
f. Or approved equivalent.

I. Gauges:
1. Ashcroft; Model 105P-XUL.
2. US Gauge; Model 1590K.
3. Brecco
4. Reliable Automatic Sprinkler Company
5. Fire Protection Products, Incorporated (FPPI)
6. Allied Rubber and Gasket Company Incorporated, dba ARGCO
7. Wika Instrument Corporation
8. Or approved equivalent.

J. Bells:
1. Interior/Exterior Alarm Bells:
a. Potter; Model PB, 8-inch.
b. System Sensor
c. Or approved equivalent.

K. Fire Department Connection:
1. Guardian Fire Equipment
2. Fire End Croker Corporation
3. Potter-Roemer
4. Elkhart Brass
5. Tyco Fire & Building Products
6. Or approved equivalent.

L. Valves:
1. OS&Y Gate:
a. 175 PSI:

1) Nibco; Model F-607-0.
2) Mueller; Model R-2360-6.
3) Or approved equivalent.

b. 250 PSI:
1) Victaulic; Model 771.
2) Or approved equivalent.

c. 350 PSI:
1) Nibco; Model F697-0.
2) Or approved equivalent.

d. 2-inches and Smaller:
1) Nibco; Model T-104.
2) Or approved equivalent.

2. NRS Gate:
a. 175 PSI:
1) Nibco M/F-609 with Nibco NIP1A for yard use.
2) Nibco M/F-609 with Nibco NIP2A for wall use.
3) Or approved equivalent.

b. 200 PSI:
1) Mueller A-2361 with Mueller A-2080x indicator post for yard use.
2) Mueller A-2361 with Mueller A-20813 wall type indicator post for wall use.
3) Or approved equivalent.

c. 250 PSI:
1) Victaulic; Model 772, with Model 774 indicator post for yard use.
2) Victaulic; Model 772, with Model 773 wall type indicator post for wall use.
3) Or approved equivalent.

3. Swing Check:
a. Victaulic; Model 717.
b. Nibco; Model F-908-W.
c. Mueller; Model A-2122-6.
d. Viking Easy Riser Swing Check.
e. Tyco; Model CV-1F.
f. AnvilStar; Series 78FP.
g. Or approved equivalent.

4. Wafer Check:
a. Nibco; Model W-900-W.
b. Mueller; Model A2102.
c. Viking
d. Tyco
e. Or approved equivalent.

5. Butterfly Valves:
a. Victaulic; Series 705, Series 707, Series 765, Series 766.
b. Nibco; Model WD3510-8.
c. Tyco; Model BFV-N.
d. Use lug body next to pumps; Nibco; Model LD-3510-6.
e. Or approved equivalent.

6. Pressure Relief:
a. Watts; Model FP-53L.
b. United Brass Works; Model 132.
c. AGF
d. Or approved equivalent.

7. Automatic Ball Drip Drain Valve:
a. Tyco; Model AD-1,-2.
b. Reliable Automatic Sprinkler Company
c. Or approved equivalent.

8. Three-Way Gauge Valve:
    a. Fire Protection Products Incorporated (FPPI): 1/4-inch IPS, UL/ULC Listed, 300 psi.
    b. AGF Manufacturing Inc.; Model 7600, 1/4-inch 3-Way Globe Valve.
    c. Nibco; 400 PSI WWP Bronze Side Outlet Globe Valve KT-291-W3.
    d. Or approved equivalent.
9. Automatic Air Release Valve:
    a. Potter Electric Signal Company
    b. Or approved equivalent.
10. Ball Valve:
    a. Victaulic; Series 728.
    b. Apollo Valves; 64 Series, 1/4-inch through 2-inches.
    c. Fire Protection Products Incorporated (FPPI)
    d. Nibco; Models KX-505-W-8, KT-580-70-UL, or KT-585-70-UL.
    e. Or approved equivalent.

M. Pipe Valve and Fire Protection Equipment Identification:
1. Fire Protection Products, Incorporated (FPPI)
2. Allied Rubber and Gasket Company, Incorporated, dba ARGCO
3. Or approved equivalent.

N. Signs:
1. Tyco Fire Products
2. Reliable Automatic Sprinkler
3. Viking Corporation
4. Allied Rubber and Gasket Company, Incorporated, dba ARGCO
5. Or approved equivalent.

O. Drains:
1. Reference Aboveground Black Steel Pipe and Fittings.
2. AGF
3. Victaulic
4. Or approved equivalent.

## 2.02 ABOVEGROUND BLACK STEEL PIPE AND FITTINGS

A. Wet Pipe Systems:
1. Pipe Size 2-inch Diameter and Smaller: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 40.
2. Pipe Size 2-1/2-inch Diameter and Larger: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 10.
3. Exposed pipe 8-feet or less above finished floor: A minimum of Schedule 40.

B. Dry Pipe Systems:
1. Pipe Size 2-inch Diameter and Smaller: ASTM A53, ASTM A135, or ASTM A795; Schedule 40 only, shop welded, cut grooved.
2. Pipe Size 2-1/2-inch Diameter and Larger: ASTM A53, ASTM A135, or ASTM A795; minimum of Schedule 10.

C. Exposed pipe 8-feet or less above finished floor: Minimum of Schedule 40.

D. Joints:
1. Threaded, flanged or bevel welded.
2. Piping installed in plenums or shafts to have welded joints.

E. Fittings:
1. Threaded:
    a. Malleable Iron: Class 150 and Class 300, ANSI B16.3.
    b. Cast Iron: Class 125 and 250, ANSI B16.3.
2. Flanged:
    a. Cast iron; Class 125 and 250, ASME B16.1.

b. Raised ground face, bolt holes spot faced.

3. Welded:
   a. Carbon Steel: Long radius, standard weight or extra strong.
   b. Factory Wrought Steel Buttweld Fittings: ASME B16.9.
   c. Buttwelding Ends for Pipe, Valves, Flanges and Fittings: ASME B16.25.
   d. Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures: ASTM A234.
   e. Steel Pipe Flanges and Flanged Fittings: ASME B16.5.
   f. Forged Steel Fittings, Socket Welded and Threaded: ASME B16.11.
4. Mechanical Fittings and Grooved Couplings:
   a. Couplings: UL 213, AWWA C606, ASTM A536 ductile iron or ASTM A47 malleable iron, with enamel finish and grooves or shoulders designed to accept grooved couplings. Synthetic-rubber gasket with central-cavity, pressure-responsive design and ASTM A183 carbon-steel bolts and nuts.
   b. FM Global approved.

F. Anti-Microbial Coating: Factory-applied coating to inhibit corrosion from microbiological organisms.

## 2.03 WALL AND FLOOR PENETRATIONS AND SLEEVES

A. Below Grade and High Water Table Areas: Waterproof elastomeric compound.

## 2.04 SWITCHES, VALVE SUPERVISORY

A. Provide to mount on applicable, compatible valve (OS&Y gate, or PIV), with SPDT switches to match requirements of fire alarm system. Provide with cover tamper switch where required by AHJ.

## 2.05 SWITCHES, WATER DETECTOR

A. Provide with cover tamper switch where required by AHJ.

B. Water Flow Switches:
   1. Vane-type; SPDT switches; electronic retard, adjustable time delay (0 to 75 seconds).
   2. Wet Sprinkler Systems, NFPA 13: 450 PSI, 18-feet per second, 4-10 gpm.

C. Pressure Operated Alarm Switches: Pressure actuated with SPDT electrical switches and adjustable time delay (0 to 75 seconds).

## 2.06 HANGERS AND SUPPORTS

A. General: Select size of hangers and supports to exactly fit pipe size for bare piping.

B. Hangers: Ferrous.

C. Hanger Rods:
   1. Concealed Spaces: Continuously threaded or threaded ends.
   2. Exposed Spaces: Threaded ends.

D. Finishes: Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

E. Materials:
   1. Use carbon steel pipe hangers and supports, metal trapeze pipe hangers and attachments for general service applications.
   2. Use stainless steel hangers, rods and attachments for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries and the like.

F. Anti-Scratch Padding: Use padded hangers for piping subject to scratching.

## 2.07 STRUTS AND STRUT CLAMPS

A. Electro-galvanized steel.

B. Designed for supporting pipe runs from strut supports.

C. UL listed for pipe up to 8-inches in diameter.

D. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries and the like.

**2.08 SWAY BRACES AND RESTRAINTS**

A. Sway Bracing: From a single manufacturer and compatible with sway brace calculation program.

B. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries, and the like.

**2.09 ANCHORS AND ATTACHMENTS**

A. General: Anchor supports to masonry, concrete and block walls per anchoring system manufacturer's recommendations, or as modified by project Structural Engineer.

B. Materials:
   1. Ferrous.
   2. Stainless steel for corrosive environment applications. Examples of corrosive environment applications include, but are not limited to: swimming pools and spas, pool and spa equipment rooms and adjacent areas, chemical rooms, kidney dialysis areas, marine and beach environments, commercial laundries, and the like.

C. Cast in Place Anchors for Hangers: Verify listing is for hangers, braces, or both.

D. Attachments in Concrete:
   1. Suitable for hanging and bracing fire protection systems in concrete which is subject to cracking in a seismic event.
   2. Seismic Design Areas C, D, E and F:
      a. Compatible with International Code Council Evaluation Service Acceptance Criteria AC-193 and AC308 for expansion, screw and adhesive anchors. Meet requirements of ACI 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary.
      b. All models of Hilti HDI and ITW Red Head Multi-Set II anchors are not approved for attaching fire protection systems in Seismic Design Areas C, D, E and F. No Exceptions.

E. ITW Buildex Sammys with FM Approval only are not allowed in certain seismic zones. Verify with FM that FM Approval is effective in project's seismic zone.

**2.10 GAUGES**

A. Pressure Gauges: 3.5-inch, dial type, bronze bourdon tube or spring type, stainless steel case. 0 to 300 PSI.

**2.11 BELLS**

A. Exterior Alarm Bells: Minimum weatherproof backbox, typical 90 dBA at 10-feet.

**2.12 FIRE DEPARTMENT CONNECTION**

A. General:
   1. Thread to match fire department hardware; automatic drip connected to drain; threaded dust cap and chain of same material and finish as body.
   2. Provide with individual clappers.

B. Type: Free-Standing Type

C. Finish: Ductile Iron

D. Inlet Size: 2-1/2-inch.

E. Number of Inlets: Two.

F. Outlet Size: 4-inch.

G. Size of Pipe between Fire Department Connection and Sprinkler System: 4-inch.

H. Drain: 3/4-inch automatic ball drip, to outside.

I. Sign: Auto Sprinkler Fire Department Connection

**2.13 VALVES**

A. OS&Y Gate:
   1. 2-1/2-inches and Larger: Iron body.
   2. 2-inches and Smaller: Bronze body.

B. NRS Gate:
   1. Iron body. Non-rising stem with indicator post.
   2. Underground Butterfly Valves: Telescopic barrel type.

C. Swing Check: Iron body, rubber and bronze faced checks.

D. Wafer Check: Iron body, rubber seat, spring actuated.

E. Butterfly Valves: Ductile iron body with factory-installed tamper switches. Use lug body next to pumps.

F. Pressure Relief: Bronze body, stainless steel spring.

G. Automatic Ball Drip Drain Valve: Bronze, spring-type.

H. Three-Way Gauge Valve: Brass; rated to 300 psi.

I. Automatic Air-Release Valve for Wet Systems:
   1. Rated to 175 psi.
   2. Automatic float-type with shutoff mounted in a water retention pan.
   3. Single set 24VAC@2A for electronic supervision.
   4. Ball valve switch with cover tamper.

J. Ball Valves: Brass body, brass stem; forged brass ball disc.

**2.14 PIPE VALVE AND FIRE PROTECTION EQUIPMENT IDENTIFICATION**

A. Engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker.

B. Corrosion-resistant chain or permanent adhesive.

**2.15 SIGNS**

A. Engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker.

B. Corrosion-resistant chain or permanent adhesive.

**2.16 DRAINS**

A. Reference Aboveground Black Steel Pipe and Fittings.

**PART 3 - EXECUTION**

**3.01 GENERAL INSTALLATION REQUIREMENTS**

A. Install in conformance with UL Listing, FM Approval or ICC-ES requirements and restrictions.

**3.02 ABOVEGROUND BLACK STEEL PIPE AND FITTINGS**

A. Piping Routing:
   1. Route piping, except as otherwise indicated, vertically and horizontally (sloped to drain). Avoid diagonal runs wherever possible. Orient horizontal routes parallel with walls and beam lines.
   2. Install piping as shown or described by diagrams, details and notations on Drawings or, if not indicated, install piping to provide the shortest route which does not obstruct usable space or block access for servicing the building and its equipment.

3. Install piping in concealed spaces above finished ceilings. Prior to design and installation. obtain pre-approval by Architect for exposed piping.
4. In open-to-structure areas which are open to public view, route exposed piping to minimize visual impact. Obtain Architect's and Engineer's approval of exposed piping installation.
5. Coordinate installation with other trades. Route piping as required to avoid building structure, equipment, plumbing piping, HVAC piping, ductwork, lighting fixtures, electrical conduits and bus ducts and similar work. Final location of lighting will have priority over final sprinkler locations. Provide drains to trapped sections of system which result from such routing. Other trades take precedence for installation space.
6. Support piping adjacent to walls, overhead construction, columns and other structural and permanent enclosure elements of the building. Limit clearance to 2-inches wherever furring is indicated for concealment of piping. Allow for insulation thickness. Locate insulated piping to provide minimum 1-inch clearance outside insulation.
7. Wherever possible in finished and occupied spaces, conceal piping from view by locating within column or beam enclosures, hollow wall construction, or above suspended ceilings. Do not encase horizontal routes in solid partitions, except where approved.
8. General Electrical Equipment Clearances: Do not route piping through electrical rooms, transformer vaults, elevator equipment rooms and other electrical or electronic equipment spaces and enclosures. Within equipment rooms, provide minimum 3-feet lateral clearance from sides of electric switchgear panels. Do not route piping above electric power or lighting panel, switchgear, or similar electric device. Coordinate with electrical and coordinate exact pipe routing to provide proper clearance with such Item.
9. Route water filled and dry system piping around, not into or through, rooms protected by pre-action systems, clean-agent systems, gaseous suppression systems and other alternative fire suppression systems.
10. Install piping as close as possible to ceiling to avoid conflicts with other trades.
11. Install pipe runs to minimize obstruction to other work.
12. Pitch pipe for dry system piping passing through warm as well as cold areas.

B. Couplings:
   1. Install where indicated on Drawings and on each side of pieces of equipment to permit easy removal of equipment.
   2. Deburr cut edges.

C. Pipe Penetrations: Wire pipe cutout coupon at point of pipe penetration.

D. Pipe and Pipe Fittings:
   1. Expansion and Flexibility: Install work with due regard for expansion and contraction to prevent damage to the piping, equipment, building and its contents. Provide piping offsets, loops, approved type expansion joints, sway bracing, wire restraints, vertical restraints, flexible couplings or other means to control pipe movement and to minimize pipe forces.
   2. Coordinate support of pipe 4-inches and larger with Structural Engineer.
   3. Provide clearances around piping per NFPA 13.
   4. Pitch pipe for dry system piping located or passing through warm as well as cold areas.
   5. Install welded pipe with welds facing vertically up, or where this is not possible, as close as possible to vertical between 46 degrees and 234 degrees. Intent is to minimize corrosion caused by moisture in the bottom of pipes.

## 3.03 WALL AND FLOOR PENETRATIONS AND SLEEVES

A. Escutcheons: Install on exposed pipes passing through walls or floors.
   1. Pipe Sleeves: Lay out work in advance of pouring concrete and furnish and set sleeves necessary to complete work.
   2. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with nonshrinking fire and water resistant grout or approved equivalent caulking compound. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements.

3. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Caulk/seal piping passing through fire-rated building assemblies with UL Listed or FM Approved fire-rated firestopping compound. Provide fire-rated assemblies per local AHJ requirements.
4. Beam Sleeves:
   a. Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Penetrations must be indicated on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.
5. Penetrations in Fire-Rated Wall/Floor Assemblies:
   a. Reference Division 07, Thermal and Moisture Protection.
   b. Coordinate with Drawings location of fire rated walls, ceilings and floors. When these assemblies are penetrated, seal around piping and equipment with approved firestopping material.
   c. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814 and NFPA.
   d. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814.

**3.04 SWITCHES, VALVE SUPERVISORY**

A. Coordinate with Division 28, Electronic Safety and Security.

**3.05 SWITCHES, WATER DETECTOR**

A. Wire pipe cutout coupon at point of connection of switch to pipe.

B. Flow switches: Connect to system side of valves and drain connections.

C. Coordinate with Division 28, Electronic Safety and Security.

**3.06 HANGERS AND SUPPORTS**

A. Installation of pipe hangers, inserts and supports to conform to NFPA 13. Provide adjustable hangers, inserts, brackets, clamps, supplementary steel and other accessory materials required for proper support of pipe lines and equipment. Provide supplementary materials for proper support and attachment of hangers.

**3.07 STRUTS AND STRUT CLAMPS**

A. Install per manufacturer's listed orientation.

**3.08 SWAY BRACES AND RESTRAINTS**

A. Locate per orientation and spacing as required by sway brace calculations.

B. Attach sway bracing directly to pipe or equipment being braced.

C. Do not attach sway bracing to bottom of truss members.

**3.09 ANCHORS AND ATTACHMENTS**

A. In post-tension construction, determine location of post-tension cables and install anchors to avoid contact or interference with post-tension cables. Coordinate with Structural.

B. Do not use powder-driven attachments.

C. Building Attachments and Inserts: Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves and flanges, for sizes NPS 2-1/2 and larger. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

D. Hanger and Support Attachments:

1. Concrete:
   a. Before Pouring: Support piping and equipment from malleable iron concrete form inserts placed before concrete is poured.
   b. After Pouring:
      1) Where supports in slabs are required after concrete has been poured, provide drilled-in threaded inserts (mechanical-expansion anchors), installed in accordance with manufacturer's recommendations.
      2) Install mechanical-expansion anchors after concrete is completely cured and in accordance with manufacturer's installation instructions.
      3) Where anchors are to be installed in post-tension construction, determine and avoid locations of post-tension cables prior to drilling.
2. Metal Floor Deck: Support hangers per UL Listing or FM Approval for selected concrete insert before pouring of concrete topping, or from beam clamps fastened to structural steel.
3. Steel Joists: Support hangers from beam clamps fastened to bar joists or to auxiliary steel between bar joists as required.
4. C-Clamp Hangers: Do not attach to one side of double-angle bottom members.
5. Locate and install hangers, supports and attachments connecting to I-joists, structural insulated panels (SIPs), cross laminated timber and similar engineered structural products according to the structural product manufacturer specifications.

E. Make available to the Architect information required to verify the anchorage, sway bracing and restraint of fire protection systems.

**3.10 GAUGES**

A. Install gauges conveniently and accessibly located with reference to finished building for repairs, removal and service.

B. Install with dial positioned for maximum visibility.

**3.11 BELLS**

A. Locate exterior alarm bells at 8-feet above finished grade. Coordinate with Architect.

B. Coordinate with Divisions 26, Electrical and Division 28, Electronic Safety and Security.

**3.12 FIRE DEPARTMENT CONNECTION**

A. Locate with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

B. Provide method of draining FDC piping. Drain to sanitary sewer by indirect connection, or to exterior where damage, including damage to landscaping and staining of concrete, will not occur.

C. Locate away from building egress paths. Coordinate location with Fire Marshal.

**3.13 VALVES**

A. General:
   1. Provide post indicator on buried control valves.
   2. Inspect valves for leaks. Adjust or replace packing to stop leaks. Replace valve if leak persists.

B. Installation:
   1. Install valves where required for proper operation, testing and drainage. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install conveniently and accessibly located with reference to finished building for repairs, removal and service.
   2. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to centerline of pipe. Install for proper direction of flow.
   3. Wafer Check Valves: Install between two flanges in horizontal or vertical position, position for proper direction of flow.

C. Pressure Relief Valves: Provide piping to permanent drain.

## 3.14 PIPE VALVE AND FIRE PROTECTION EQUIPMENT IDENTIFICATION

A. Install engraved plastic laminate or corrosion resistant metal sign or plastic equipment marker, secured with corrosion-resistant chain or permanent adhesive on or near each Item of fire suppression equipment and each operational device, as specified in this specification if not otherwise specified for each Item or device. Provide signs for the following general categories of equipment and operational devices: Valves, drains, pumps, standpipes, tanks and similar equipment. Provide valve tag on every valve and control device in each piping system. Exclude check valves and valves within factory fabricated equipment units. List each tagged valve in valve schedule for each piping system.

B. Each new piece of equipment to bear a permanently attached identification plate, listing manufacturer's name, capacities, sizes and characteristics.

C. Piping to bear the manufacturer's name, schedule of thickness, size and ASTM identification number

D. Provide valve tag on every valve and control device in each piping system. Exclude check valves and valves within factory fabricated equipment units. List each tagged valve in valve schedule for each piping system.

E. Drain, Auxiliary Drain and Drum Drips: Provide valve tag on every valve in each fire suppression system. List each tagged valve and its location in valve schedule, identify on fire suppression drawings.

F. Install framed, glass or rigid transparent plastic covered, mounted valve schedule and valve location drawing in main riser or fire pump room.

G. Provide identification sign on ceiling tile below valve location.

H. Provide permanent identification sign at pressure regulating valves stating required setting of pressure regulator.

I. Adjusting: Relocate fire suppression identification device which has become visually blocked.

J. Cleaning: Clean face of identification devices and glass frames of valve charts.

## 3.15 SIGNS

A. General Information Signs: Provide a general information sign used to determine system design basis and information relevant to the inspection, testing and maintenance requirements required by NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems. Such general information is to be provided with a permanently marked weatherproof metal or rigid plastic sign, secured with corrosion-resistant wire, chain, or other acceptable means. Such signs are to be placed at each system control rise loop and auxiliary system control valve. The sign is to include the following information:

1. Name and Location of the Facility Protected
2. Presence of High-Piled and/or Rack Storage
3. Maximum Height of Storage Planned
4. Flow Test Data
5. Location of Auxiliary Drains and Low Point Drains
6. Original Results of Main Drain Flow Test
7. Name of Installing Contractor or Designer
8. Indication of presence and location of other auxiliary systems.

B. Dry Signs: At system riser supplying dry systems, provide the following information: volume in gallons contained in each system.

## 3.16 DRAINS

A. Locate drain connections within 7-feet of floor. Provide piping capable of being fully drained.

B. Provide a drain vent at top of vertical drains. Coordinate with Division 22, Plumbing.

C. Coordinate location of auxiliary drains with Architect. Architect to approve location before drain is installed.

D. Protect drains from tampering and accidental operation.

E. Protect drain discharge at the exterior with a turned-down 45 degree elbow.

**END OF SECTION**

# SECTION 21 13 00
# FIRE SUPPRESSION SPRINKLER SYSTEMS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Work Included:
   1. Sprinklers
   2. Flexible Sprinkler Hose Fitting Assembly - For fire sprinklers in suspended ceilings which are supplied by a wet pipe system.
   3. Oversized Sprinkler Escutcheons - For dry sprinklers in suspended ceilings which are supplied by a wet pipe or dry pipe system.
   4. Inspector's Test Connection
   5. Dry-Pipe Valve
   6. Air Compressor
   7. Spare Sprinkler Cabinet

B. This is a contractor designed system. Contact AHJ prior to bid to verify fire system requirements. Provide design compliant with codes as interpreted by AHJ.

C. Scope:
   1. Wet-Pipe Sprinkler System.
   2. Revision and extension of existing system to new and remodeled areas.
   3. Sprinkler protection for areas subject to 40 degrees F and lower: Dry-pipe sprinkler system, dry sprinklers in areas subject to 40 degrees F or less.
   4. Private fire service main, including connection to existing utility and piping to the inlet connection inside the building. Provide required valves, backflow preventer, vaults and appurtenances.

D. Coordinate location and type of tamper, flow and pressure switches and fire alarm system.

E. Provide electrical connections and wiring as required for a complete and operable system. Includes but is not limited to bells, air compressors, sump pumps, fire pumps, jockey pumps and pump controllers.

### 1.02 RELATED SECTIONS

A. Contents of Division 21, Fire Suppression and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:
   1. Division 22, Plumbing
   2. Division 23, Heating, Ventilating and Air-Conditioning
   3. Division 26, Electrical
   4. Division 28, Electronic Safety and Security
   5. Section 21 00 00, Fire Suppression Basic Requirements
   6. Section 21 05 00, Common Work Results for Fire Suppression

### 1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

### 1.04 SUBMITTALS

A. Submittals as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

B. In addition, provide:
   1. Hydraulic calculations.
   2. Sway brace calculations.
   3. Details of sway bracing.
   4. Details of interval and end of branch line restraints.

5. Details of flexible sprinkler hose fitting assembly, including number and radius of bends, corresponding to equivalent feet used in hydraulic calculations. Provide details of sign to be installed at each flexible sprinkler hose fitting assembly.
6. Details of oversized ceiling penetrations and oversized sprinkler escutcheons.
7. Trapeze hanger details and calculations, including size, length and material. Additionally, provide size, weight and number of pipes to be carried on the trapeze.
8. On submittal and As-Built drawings, provide text of sprinkler list to be installed in the spare sprinkler cabinet.

**1.05 QUALITY ASSURANCE**

A. Quality assurance as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

**1.06 WARRANTY**

A. Warranty of materials and workmanship as required by Section 21 00 00, Fire Suppression Basic Requirements and Division 01, General Requirements.

**1.07 SYSTEM DESCRIPTION**

A. Provide coverage for entire building. Field verify field conditions prior to submittal of bid. Adjust bid to provide protection features in accordance with applicable codes and interpretations by AHJ. Provide design and installation based on more stringent requirements if this specification and AHJ requirements differ from Code.

B. Design Parameters:
   1. Increase remote design area for dry systems, sloped roofs, and concealed areas per NFPA 13.
   2. Building Areas: Classrooms, Offices, Hallways and Common Spaces.
      a. Occupancy Classification: Light.
   3. Building Area: Mechanical Spaces.
      a. Occupancy Classification: Ordinary Group 1.
   4. Design parameters above are NFPA 13 minimums. Provide increased design densities, design areas and hose allowances to meet requirements of AHJ.

C. Sprinkler system design to include a 10 percent pressure and flow cushion between system demand point and available water supplies.

D. Extend hydraulic calculations from hydraulically most remote design area back to location of pressure hydrant of flow test or effective point of water supply where characteristics of water supply are known.

E. Develop cost-effective designs that may include use of extended coverage sprinklers and design area reductions as allowed by NFPA 13.

**1.08 EXTRA STOCK**

A. Provide extra sprinklers per code.

B. Provide suitable wrenches for each sprinkler type and metal storage cabinet in riser room.

**1.09 CONTROL VALVES**

A. Sprinkler system control valves to be OS&Y or butterfly valves located inside building in a room with outside door.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

A. Sprinklers:
   1. Finished Areas:
      a. Victaulic
      b. Viking
      c. Tyco
      d. Reliable

e. Globe
f. Senju
g. Or approved equivalent.

2. Nonfinished Areas:
a. Victaulic
b. Viking
c. Tyco
d. Reliable
e. Globe
f. Or approved equivalent.

3. Dry Sprinklers:
a. Victaulic
b. Viking
c. Tyco
d. Reliable
e. Or approved equivalent.

B. Flexible Sprinkler Hose Fitting Assembly:
1. Victaulic; VicFlex.
2. Flexhead Industries
3. SprinkFLEX
4. Allied Rubber and Gasket Company, Incorporated, dba ARGCO
5. Reliable Automatic Sprinkler Company
6. Tyco Fire and Building Products
7. Viking Corporation
8. Or approved equivalent.

C. Oversized Sprinkler Escutcheons:
1. Victaulic; FireLock Expansion Plates.
2. Viking Corporation; Expansion Plate.
3. Tyco Fire Protection Products; Wide Adapter Plates.
4. Reliable Automatic Sprinkler; Extender Rings.
5. Globe Fire Sprinkler Corporation; Seismic Escutcheons.
6. Or approved equivalent.

D. Inspector's Test Connection:
1. Combination Test and Drain:
a. Victaulic; Series 720 TestMaster II Alarm Test Module with pressure relief valve.
b. AGF; Model 1011, 2511, 3011, with pressure relief valve.
c. Or approved equivalent.

2. Dry System Inspector's Test Connection:
a. AGF; Model 3011.
b. Or approved equivalent.

E. Dry-Pipe Valve:
1. Victaulic; Model FireLock NXT.
2. Viking; Model G-4000.
3. Tyco; Model DPV-1.
4. Or approved equivalent.

F. Air Compressor:
1. General
2. Gast
3. Or approved equivalent.

G. Spare Sprinkler Cabinet:
1. Victaulic
2. Fire Protection Products, Inc. (FPPI).

3. Tyco Fire & Building Products
4. Allied Rubber and Gasket Co.
5. Potter Roemer Fire Pro.
6. Or approved equivalent.

**2.02 SPRINKLERS**

A. Finished Areas:
   1. Type: Glass-Bulb
   2. Style:
      a. Concealed
      b. Recessed
   3. Response: Match thermal characteristics of existing sprinklers in area.
   4. Finish:
      a. Chrome
      b. White Polyester
      c. Black
   5. Escutcheon:
      a. White Polyester
      b. Black
   6. Coverplate for Concealed Sprinklers:
      a. Flat Plate
      b. White

B. Nonfinished Areas:
   1. Type: Glass-Bulb
   2. Response: Match thermal characteristics of existing sprinklers in area.
   3. Finish:
      a. Brass
      b. Black

C. Dry Sprinklers:
   1. Type: Glass-Bulb
   2. Style:
      a. Concealed
      b. Recessed
   3. Response: Match thermal characteristics of existing sprinklers in area.
   4. Finish:
      a. Chrome
      b. White Polyester
   5. Escutcheon:
      a. Chrome
      b. White Polyester
   6. Coverplate for Concealed Sprinklers:
      a. Flat Plate
      b. Chrome
      c. White
   7. Dry Sprinkler Boot: Manufactured for use with the dry sprinkler it protects.

D. Pendent sprinklers supplied by dry or preaction piping: Dry pendent type.

**2.03 FLEXIBLE SPRINKLER HOSE FITTING ASSEMBLY**

A. Fully welded non-mechanical fittings, stainless steel, braided, leak-tested with minimum 1-inch true-bore internal corrugated hose diameter. 175 psi.

B. Ceiling Bracket: Galvanized steel, direct attachment type, with integrated snap-on clip ends and removable flexible hose attachment with set screw. FM1637, UL 2443.

C. Affix permanent sign, label or decal at each flexible sprinkler hose fitting assembly anchoring component limiting the relocation of the sprinkler.

**2.04 OVERSIZED SPRINKLER ESCUTCHEONS**

A. Metal.

B. Provide oversized ceiling penetrations and oversized sprinkler escutcheons for pendent sprinklers to comply with Building Code and ASCE-7 seismic requirements.

C. Same manufacturer as sprinklers.

**2.05 INSPECTOR'S TEST CONNECTION**

A. Combination Test and Drain: Bronze body, brass stem, impregnated Teflon seat, chrome coated brass ball, steel handle with positive stops, tamper resistant test orifice, integral tamper resistant sight glasses, tapped and plugged port for system access, steel identification plate. Provide with pressure relief valve and drainage piping with bronze body and stainless steel spring.

B. Dry System Inspector's Test Connection: Bronze, brass stem, steel handle, chrome-plated bronze ball, Teflon valve seat, tamper and corrosion resistant orifice equivalent to smallest sprinkler orifice, sight flow connection.

**2.06 DRY-PIPE VALVE**

A. Differential or low pressure actuator type.

B. Trim as recommended by manufacturer for variable pressure service, including air maintenance device, electric low pressure alarm switch, priming valves and test, main drain and pressure gauges.

C. External reset.

**2.07 AIR COMPRESSOR**

A. Manufactured for fire sprinkler systems.

B. Tank mounted with automatic drain valve and compatible air maintenance device.

C. Riser mounted is not acceptable.

D. UL Listed pressure switch.

E. Air pressure gauge.

F. Tank to be provided with a 1/2-inch minimum outlet for air supply.

**2.08 SPARE SPRINKLER CABINET**

A. NFPA 13 and 13R Systems: Sized to accommodate a minimum of two spare sprinklers of each Sprinkler Identification Number (SIN), manufacturer, model, orifice, deflector type, temperature and thermal sensitivity, or a minimum of six sprinklers for facilities having under 300 sprinklers, or a minimum of 12 sprinklers for facilities having 300 to 1000 sprinklers, or a minimum of 24 sprinklers for facilities having over 1000 sprinklers, whichever is more.

B. NFPA 13D Systems: Sized to accommodate a minimum of three spare sprinklers of each type and temperature.

C. Welded steel with hinged steel cover.

D. Red enamel or polyester coated finish inside and out.

**PART 3 - EXECUTION**

**3.01 GENERAL INSTALLATION REQUIREMENTS**

A. Install per manufacturer's requirements and recommendations.

**3.02 SPRINKLERS**

A. Center sprinklers in center or quarter points of suspended ceiling tile.

B. Align sprinklers with architectural column lines, lighting, diffusers and other ceiling features. In unfinished ceilings, route piping to minimize visual impact. Sprinklers and piping not so aligned are to be removed and replaced at no additional cost to Owner.

C. Install dry sprinklers in a manner which does not trap water.

**3.03 FLEXIBLE SPRINKLER HOSE FITTING ASSEMBLY**

A. Install flexible sprinkler hose fitting assemblies where pendent sprinkler heads are located in acoustic ceiling tiles.

B. Install with no more bends than are included in equivalent footage used in hydraulic calculations.

C. Maintain manufacturer's recommended bending radius as included in equivalent footage used in hydraulic calculations.

D. Affix permanent sign, label or decal at each flexible sprinkler hose fitting assembly anchoring component limiting the relocation of the sprinkler.

**3.04 OVERSIZED SPRINKLER ESCUTCHEONS**

A. Coordinate oversized sprinkler escutcheons with ceiling construction and sprinkler style.

B. Provide for dry sprinkler penetrations in suspended ceilings.

**3.05 INSPECTOR'S TEST CONNECTION**

A. Locate where full flow discharge or pressure relief valve discharge will not do damage, including damage to landscaping and will not cause dangerous conditions to walking surfaces or discoloration to building surfaces.

B. Locate within 5-feet of finished floor.

**3.06 DRY-PIPE VALVE**

A. Install with sufficient access for ease of reset.

**3.07 AIR COMPRESSOR**

A. Provide air compressor sized to fill system and to maintain system pressure as required per Code.

B. Pipe fluid discharge automatic tank reservoir to sanitary sewer, with air gap.

C. Locate in an area between 40 degrees F and 110 degrees F.

D. Provide 12- to 18-inches clearance from walls or other obstructions that will interfere with airflow through the motors fan building into the motor. Protect from excessive heat, such as near a boiler.

E. Provide a flexible hose between the compressor and service piping when vibration isolators are used.

**3.08 SPARE SPRINKLER CABINET**

A. Attach to wall at the main sprinkler system riser.

B. Locate so cover is easy to open and readily accessible.

C. Locate in an area with a temperature between 40 and 100 degrees Fahrenheit (4 and 38 degrees Celsius).

D. Locate sprinkler wrenches inside cabinet.

E. Inside the cabinet, provide a list of sprinklers installed in the property, including sprinkler identification number, manufacturer, model, orifice, deflector type, thermal sensitivity and pressure rating, quantity of each type to be contained in the cabinet and issue or revision date of the list.

**END OF SECTION**