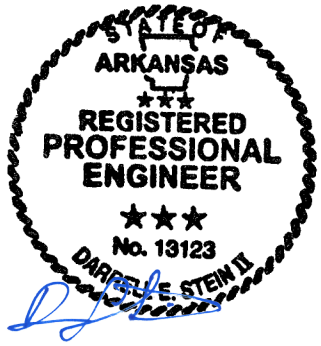
The Engineer of Record for Division 21 and 28 of the Specifications, including:

210010	GENERAL FIRE SUPPRESSION REQUIREMENTS
210500	COMMON WORK RESULTS FOR FIRE SUPPRESSION
210515	BASIC FIRE SUPPRESSION PIPING MATERIALS AND METHODS
210533	HEAT TRACING FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
210553	IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
211100	FIRE SUPPRESSION WATER SERVICE PIPING
221200	FIRE SUPPRESSION STANDPIPES
211313	WATER BASED FIRES SUPPRESSION SYSTEMS
284600	FIRE DETECTION AND ALARM

for the AWSOM, Bentonville, AR Project No. 993A is:



02/22/2023

Date

PART 1 - GENERAL REQUIREMENTS

1.01 DESCRIPTION OF WORK

A. This Division requires the furnishing and installing of complete functioning systems, and each element thereof, as specified or indicated on the Drawings and Specifications or reasonably inferred; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include materials, labor, supervision, supplies, equipment, transportation, and utilities.

B. Division 21 of the Specifications and Drawings numbered with prefixes FP generally describe these systems, but the scope of the Fire Suppression work includes all such work indicated in the Contract Documents: Instructions to Bidders; Proposal Form; General Conditions; Supplementary General Conditions; Architectural, Structural, Fire Suppression, Mechanical, Plumbing, Fire Alarm and Electrical Drawings and Specifications; and Addenda.

C. The Drawings have been prepared diagrammatically intended to convey the scope of work, indicating the intended general location and arrangement of the equipment, piping, etc. without showing all the exact details as to elevations, offsets, pipe routing, and other installation requirements. The Contractor shall use the Drawings as a guide when laying out the work and shall verify that materials and equipment will fit into the designated spaces, and which, when installed per manufacturers requirements, will ensure a complete, coordinated, satisfactory and properly operating system.

D. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 7 Section “Penetration Firestopping” for material and methods for firestopping systems.
2. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.
3. Division 21 Section 210515 "Basic Fire Suppression Piping Material and Methods," for general piping and fitting materials and methods.
4. Division 21 Section 210533 “Heat Tracing for Fire-Suppression Piping” for heat tracing requirements.
5. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.
6. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.

7. Division 21 Section 211200 "Fire Suppression Standpipes" for fire suppression standpipes inside the building.
8. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire suppression sprinkler systems inside the building.

1.02 QUALITY ASSURANCE

A. All work under this division shall be executed in a thorough professional manner by competent and experienced workmen licensed to perform the Work specified.

B. All work shall be installed in strict conformance with manufacturer's requirements and recommendations. Equipment and materials shall be installed in a neat and professional manner and shall be aligned, leveled, and adjusted for satisfactory operation.

C. Material and equipment shall be new, shall be of the best quality and design, shall be current model of the manufacturer, shall be free from defects and imperfections and shall have markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size and capacity. Material and equipment of the same type shall be made by the same manufacturer whenever practicable.

D. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Threaded joints shall conform to ASME B1.20.1, Pipe Threads, General Purpose and the Pipe Fitters Handbook.

G. Regulatory Requirements: Comply with all standards listed in Section 1.2 and all applicable local requirements.

H. All electrical equipment provided and the wiring and installation of electrical equipment shall be in accordance with the requirements of this Section, Division 26 and Division 28.

I. Through and Membrane Penetration Firestopping Systems Installer Qualifications: A firm experienced in installing penetration firestopping systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

1.03 CODES, REFERENCES AND STANDARDS

A. Execute Work in accordance with the National Fire Protection Association Standards and all Local, State, and National codes, ordinances and regulations in force governing the particular class of Work involved. Obtain timely inspections by the constituted authorities, and upon final completion of the Work obtain and deliver to the Owner executed final certificates of acceptance from the Authority Having Jurisdiction.

B. Any conflict between these Specifications and accompanying Drawings and the applicable Local, State and Federal codes, ordinances and regulations shall be reported to the Architect in sufficient time, prior to the submission of Bids, to prepare the Supplementary Drawings and Specification Addenda required to resolve the conflict.

C. The governing codes are minimum requirements. Where these Drawings and Specifications exceed the code requirements, these Drawings and Specification shall prevail.

D. All material, manufacturing methods, handling, dimensions, method or installation and test procedure shall conform to but not be limited to the following industry standards and codes.

1. NFPA (National Fire Protection Association) 13, “Installation of Sprinkler Systems”, 2019 Edition.
2. NFPA 14, “Installation of Standpipes, Private Hydrants and Hose Systems”, 2019 Edition.
3. NFPA 24, “Private Fire Service Mains and their Appurtenances”, 2019 Edition.
4. NFPA 25, “Inspection, Testing and Maintenance of Water-Based Fire Protection Systems”, 2020 Edition.
5. Underwriters Laboratories, “Fire Protection Equipment Directory”, Latest Edition.
6. International Building Code (IBC), 2021 Edition with local amendments.
7. International Fire Code (IFC), 2021 Edition with local amendments.

E. Contractor shall comply with rules and regulations of public utilities and municipal departments affected by connections of services.

F. All Fire Suppression work shall be performed in compliance with applicable safety regulations, including OSHA regulations. Safety lights, guards, shoring and warning signs required for the performance of the Fire Suppression work shall be provided by the Contractor.

1.04 DEFINITIONS

A. General:

1. Furnish: The term “furnish” is used to mean “supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations.”
2. Install: The term “install” is used to describe operations at the project site including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.”
3. Provide: The term “provide” means “to furnish and install, complete and ready for the intended use.” When 'furnish', 'install', 'perform', or 'provide' is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.
4. Furnished by Owner or Furnished by Others: The item will be furnished by the Owner or Others. It is to be installed and connected under the requirements of this Division, complete and ready for operation, including items incidental to the Work, including services necessary for proper installation and operation. The installation shall be included under the guarantee required by this Division.
5. Engineer: Where referenced in this Division, “Engineer” is the Engineer of Record and the Design Professional for the Work under this Division, and is a Consultant to, and an authorized representative of, the Architect, as defined in the General and/or Supplementary Conditions. When used in this Division, it means increased involvement by, and obligations to, the Engineer, in addition to involvement by, and obligations to, the “Architect”.
6. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.
7. NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, etc.), and acceptable to the Authority having Jurisdiction (AHJ) over this project. Nationally Recognized Testing Laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other listed Manufacturers and models that meet the specified criteria.
8. Substitution: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Substitutions include Value Engineering proposals.
    a) Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
    b) Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.
9. Value Engineering: A systematic method to improve the “value” of goods and services by using an examination of function. Value, as defined, is the ratio of function to cost. Value can therefore be increased by either improving the function or reducing the cost. The goal of VE is to achieve

the desired function at the lowest overall cost consistent with required performance.

B. The terms "approved equal", “equivalent”, or "equal" are used synonymously and shall mean “accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified”. The term "approved" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

C. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

D. Other definitions for fire protection systems are listed in NFPA Standards 13, 14, and 24.

E. Working Plans, also referred to as Fire Protection Drawings as used in this Section means those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the Authority Having Jurisdiction.

F. The following definitions apply to excavation operations:

1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.
2. Sub-base: as used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.
3. Subgrade: as used in this Section refers to the compacted soil immediately below the slab or pavement system.
4. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Architect.

1.05 COORDINATION

A. The Contractor shall visit the site and ascertain the conditions to be encountered while installing the Work under this Division, verify all dimensions and locations before purchasing equipment or commencing work, and make due provision for same in the bid. Failure to comply with this requirement shall not be considered justification for omission, alteration, incorrect or faulty installation of Work under this Division or for additional compensation for Work covered by this Division.

B. The Contractor shall refer to Drawings of the other disciplines and to relevant equipment drawings and shop drawings to determine the extent of clear spaces. The Contractor shall make offsets required to clear equipment, beams and other structural members; and to facilitate concealing piping in the manner anticipated in the design.

C. The Contractor shall maintain a foreman on the jobsite at all times to coordinate his work with other contractors and subcontractors so that various components of the Fire Suppression systems will be installed at the proper time, will fit the available space, and will allow proper service access to the equipment. Carry on the work in such a manner that the work of the other contractors and trades will not be handicapped, hindered, or delayed at any time.

D. Work of this Division shall progress according to the "Construction Schedule" as established by the Prime Contractor and his subcontractors and as approved by the Architect/Engineer. Cooperate in establishing these schedules and perform the Work under this Division, in a timely manner in conformance with the construction schedule so as to ensure successful achievement of schedule dates.

E. The contractor shall coordinate work in this section with all related trades. Work and/or equipment provided in other sections and related to the fire protection system shall include, but not be limited to:

1. Sprinkler monitoring equipment (water flow switches, valve tampers, etc) shall be provided by the fire sprinkler installer, but wired and connected by Division 28.

F. System shall be complete and operational with power and control wiring provided to meet the design intent shown on the drawings and described within the specification sections.

1.06 MEASUREMENTS AND LAYOUTS

A. The drawings are schematic in nature, but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the building. Figured dimensions shall be taken in preference to scale dimensions. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing the Contract Documents. The Contractor will be held responsible for errors which could have been avoided by proper checking and inspection.

1.07 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to the requirements of individual Sections. Additionally, prepare coordination drawings as required scope of installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one trade.

1. Information shall be project specific and drawn accurately to a scale large enough to resolve conflicts. Do not base coordination drawings on standard dimensional data.

2. Prepare floorplans, sections, elevations, and details as needed to adequately describe relationship of various systems and components.
3. Clearly indicate functional and spatial relationships of components of all systems specified in the Contract Documents, including but not limited to: architectural, structural, civil, mechanical, electrical, fire protection, and specialty systems.
4. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
5. Show location and size of access doors required for access to concealed equipment, fittings, controls, terminations, and cabling.
6. Indicate required installation sequence to minimize conflicts between entities.
7. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Contract Administrator indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
8. The details of the coordination are the responsibility of the Contractor and, where indicated on the Drawings, minor adjustments in raceway routing, device placement, device type, or equipment arrangement are not to be considered changes to the Contract.

B. Equipment Room Coordination Drawings: In accordance with the submittal procedures outlined within these Specifications, provide dimensioned layouts of electrical equipment locations within electrical rooms/closets, mechanical rooms, generator rooms, and fire pump rooms with equipment drawn to scale and identified therein.

1. Clearly identify all required working clearances and access provisions required for installation and maintenance.
2. Equipment layouts should be arranged accounting for considerations for required door openings and the clearances required by the equipment manufacturer.
3. Indicate path to allow for the future removal of each large piece of equipment (up to and including generators and unit sub-station transformers) without removal of non-related equipment or architectural elements.
4. Include work provided by others routed through the equipment rooms.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. BIM File Incorporation: Develop and incorporate coordination drawing files into Building Information Model established for Project.

a) Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Contract Administrator.

3. Where Henderson Engineer's digital data files are provided to the Contractor for use in preparing coordination digital data files, Henderson Engineers makes no representations as to the accuracy or completeness of digital data files as they relate to the Drawings or Specifications.
4. Submit coordination drawings in accordance with the submittal procedures outlined within these Specifications.

1.08 SUBMITTALS

A. Refer to Division 01 and General Conditions for submittal requirements in addition to requirements specified herein.

B. Refer to Division 01 for acceptance of electronic submittals. If not specified by Division 01, provide electronic submittals. If Division 01 requires paper submittals, provide the quantity of submittals required, but no fewer than seven (7) sets.

C. For electronic submittals, Contractor shall submit the documents in accordance with this Section and the procedures specified in Division 01. Contractor shall notify the Contract Administrator and Engineer that the submittals have been posted. If electronic submittal procedures are not defined in Division 01, Contractor shall include the website, username and password information needed to access the submittals. For submittals sent by e-mail, Contractor shall copy the Contract Administrator's and Engineer's designated representatives. Contractor shall allow for the Engineer Review Time as specified. Contractor shall submit only the documents required to purchase the materials and/or equipment in the submittal.

D. Engineer Review Time: Transmit submittals as early as required to support the project schedule. Allow two weeks for Engineer review time plus to/from mailing time via the Contract Administrator, plus a duplication of this time for resubmittal if required. Transmit submittals as soon as possible after Notice to Proceed and before Mechanical construction starts.

E. Submittals and shop drawings shall not contain the firm name, logo, seal, or signature of the Engineer. They shall not be copies of the work product of the Engineer. If the Contractor desires to use elements of such product, the license agreement for transfer of information obtained from the Engineer must be used.

F. Assemble and submit for review manufacturer product literature for material and equipment to be furnished and/or installed under this Division. Literature shall include shop drawings, manufacturer product data, performance sheets, samples, and other submittals required by this Division as noted in each individual Section.

General product catalog data not specifically noted to be part of the specified product will be rejected and returned without review.

G. Separate submittals according to individual specification sections. Only resubmit those sections requested for resubmittal.

H. Provide submittals in sufficient detail so as to demonstrate compliance with these Contract Documents and the design concept. Highlight, mark, list or indicate the materials, performance criteria and accessories that are being proposed. Illegible submittals will be rejected and returned without review.

I. Refer to individual Sections for additional submittal requirements.

J. Before transmitting submittals and material lists, verify that the equipment submitted is mutually compatible with and suitable for the intended use. Verify that the equipment will fit the available space and maintain manufacturer recommended service clearances. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.

K. Submittals shall contain the following information:

1. The project name.
2. The applicable specification section and paragraph.
3. Equipment identification acronym as used on the drawings.
4. The submittal date.
5. The Contractor's stamp, which shall certify that the stamped drawings have been checked by the Contractor, comply with the Drawings and Specifications, and have been coordinated with other trades.
6. Submittals not so identified will be returned to the Contractor without action.

L. The checking and subsequent acceptance by the Engineer and/or Contract Administrator of submittals shall not relieve responsibility from the Contractor for (1) deviations from Drawings and Specifications; (2) errors in dimensions, details, sizes of equipment, or quantities; (3) omissions of components or fittings; and (4) not coordinating items with actual building conditions and adjacent work. Contractor shall request and secure written acceptance from the Engineer and Contract Administrator prior to implementing any deviation.

M. Provide shop drawings prepared in accordance with referenced standards identified as "Working Plans", including hydraulic calculations where applicable. Shop drawings shall be signed and sealed by a Professional Engineer registered in the state in which the project is located where required by local authorities having jurisdiction, or NICET Level III or IV certified technician. Submit copies of the certification for the designer with submittal. Shop drawings consisting of the following shall be furnished at a minimum. Refer to NFPA 13 for additional requirements.

1. Scaled site plan indicating underground piping with sizes and hydrants utilized for flow test in relation to the building.
2. Layout drawings of complete fire sprinkler system indicating relationship to all other trades. This shall include all equipment, piping and a reflected ceiling plan indicating sprinkler locations.
3. Complete details and sections as required to clearly define and clarify the design indicated.
4. Shop drawings shall be to a standard scale and not less than 3/32" = 1'-0".
5. Shop drawings shall be produced using computer-aided design. Hand drawn documents will not be reviewed or approved.
6. Hydraulic calculations shall be based on a water flow test conducted at the site within twelve (12) months of the submittal of plans for approval. The contractor shall be responsible for obtaining the flow test if existing data is not available. Flow test information shall be documented on shop drawings with an accompanying site plan to scale. Contractor shall verify with AHJ any minimum safety factor requirements. Demand shall not be less than 10 percent below the supply at the demand point.

    a) Hydrant testing shall be in accordance with NFPA 13 and 291 requirements.

N. Contractor shall prepare installation drawings (working shop drawings) based upon this design. Requests for deviations from the approved design shall be submitted in writing to the Engineer of Record for approval. Shop drawings showing deviations from the design without prior approval will not be approved.

O. Provide Test Reports and Certificates including:

1. "Contractor's Material & Test Certificate for Aboveground Piping"
2. "Contractor's Material & Test Certificate for Underground Piping" as described in NFPA

    a) Underground piping test certificate shall be obtained prior to connection of the aboveground system.

P. Provide welders' qualification certificates.

Q. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.

1.09 ELECTRONIC DRAWING FILES

A. In preparation of shop drawings or record drawings, Contractor may, at their option, obtain electronic drawing files in AutoCAD or DXF format from the Engineer for a shipping and handling fee of $200 for a drawing set up to 12 sheets and $15 per sheet for each additional sheet. Contact the Architect for Architect's written authorization. Contractor shall request and complete the Electronic File Release Agreement form from the Engineer. Send the form along with a check made payable to Henderson Engineers, Inc. Contractor shall indicate the desired shipping

method and drawing format on the attached form. In addition to payment, Architect's written authorization and Engineer's release agreement form must be received before electronic drawing files will be sent.

1.010 SUBSTITUTIONS

A. Refer to Division 1 and General Conditions for substitutions in addition to requirements specified herein.

B. Materials, products, equipment, and systems described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution.

C. The base bid shall include only the products from manufacturers specifically named in the drawings and specifications.

D. Request for Substitution:

1. Complete and send the Substitution Request Form attached at the end of this section for each material, product, equipment, or system that is proposed to be substituted.
2. The burden of proof of the merit of the proposed substitution is upon the proposer.
3. Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, and Owner the following:
    a) Proposed substitution has been fully investigated and determined to meet or exceed the specified Work in all respects.
    b) Proposed substitution is consistent with the Contract Documents and will produce indicated results, including functional clearances, maintenance service, and sourcing of replacement parts.
    c) Proposed substitution has received necessary approvals of authorities having jurisdiction.
    d) Same warranty will be furnished for proposed substitution as for specified Work.
    e) If accepted substitution fails to perform as required, Contractor shall replace substitute material or system with that originally specified and bear costs incurred thereby.
    f) Coordination, installation and changes in the Work as necessary for accepted substitution will be complete in all respects.

E. Substitution Consideration:

1. No substitutions will be considered unless the Substitution Request Form is completed and attached with the appropriate substitution documentation.
2. No substitutions will be considered prior to receipt of Bids unless written request for approval to bid has been received by the Engineer at least ten (10) calendar days prior to the date for receipt of Bids.

3. If the proposed substitution is approved prior to receipt of Bids, such approval will be stated in an Addendum. Bidders shall not rely upon approvals made in any other manner. Verbal approval will not be given.
4. No substitutions will be considered after the Contract is awarded unless specifically provided in the Contract Documents.

1.011 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 1 and General Conditions for Operation and Maintenance Manuals in addition to requirements specified herein.

B. Submit manuals prior to requesting the final punch list and before all requests for Substantial Completion.

C. Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division.

D. Prior to Substantial Completion for the project, furnish to the Architect, for Engineer's review, and for Owner's use, four (4) copies of Operation and Maintenance Manuals in labeled, hard-back three-ring binders, with cover, binding label, tabbed dividers and plastic insert folders for Record Drawings. Include local contacts, complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications.

E. Include the following sections with the appropriate information for each section:

1. Typewritten Index.
2. Qualifications. Provide designer and installer qualification.
3. Bill of Materials. Provide complete nomenclature, model number and vendor information for all parts.
4. Operating Instructions. Complete instructions detailing operation and maintenance of all equipment installed.
5. Product Data: Provide product cut-sheets for all equipment utilized and installed.
6. Guarantee. Copy of all guarantees and warranties issued.
7. Testing/Certification: Provide all completed testing and certification forms as required per NFPA 13 and 25.
8. Contact list with minimum three service representative phone numbers.

F. Refer to Division 1 for acceptance of electronic manuals for this project. For electronic manuals, Contractor shall submit the documents in accordance with this Section and the procedures specified in Division 1. Contractor shall notify the Architect and Engineer that the manuals have been posted. If electronic manual procedures are not defined in Division 1, Contractor shall include the website, user name and password information needed to access the manuals. For manuals sent by

e-mail, Contractor shall copy the Architect and Engineer's designated representatives.

1.012 SPARE PARTS

A. Provide to the Owner the spare parts specified in the individual sections in Division 21 specifications.

1.013 RECORD DRAWINGS

A. Refer to Division 01 and General Conditions for Record Drawings in addition to requirements specified herein.

B. A set of work prints of the Contract Documents shall be kept on the jobsite during construction for the purpose of noting changes. During the course of construction, the Contractor shall indicate on these Documents changes made from the original Contract Documents. Particular attention shall be paid to those items which need to be located for servicing. Underground utilities shall be located by dimension from column lines.

C. At the completion of the project, the Contractor shall obtain, at their expense, reproducible copies of the final drawings and incorporate changes noted on the jobsite work prints onto these drawings. These changes shall be done by a skilled drafter. Each sheet shall be marked "Record Drawing", along with the date. These drawings shall be delivered to the Architect/Engineer.

D. The fire shop drawings and all information contained therein shall be utilized as the basis for the Record Drawings.

1.014 TRAINING

A. Provide training as indicated in each specific section. Schedule training with the Owner at least 7 days in advance. Video tape the training sessions in a format as agreed to with the Owner. Provide three copies of each session to the Owner and obtain written receipt from the Owner.

1.015 PAINTING

A. Exposed ferrous surfaces, including pipe, pipe hangers, equipment stands and supports shall be painted by the Fire Suppression Contractor using materials and methods as specified under Division 9 of the Specifications; colors shall be as selected by the Architect.

B. Factory finishes, shop priming and special finishes are specified in the individual equipment specification sections.

C. Where factory finishes are provided and no additional field painting is specified, marred or damaged surfaces shall be touched up or refinished so as to leave a smooth, uniform finish.

1.016 DELIVERY, STORAGE AND HANDLING

A. Refer to Division 1 and General Conditions for Delivery, Storage and Handling in addition to requirements specified herein.

B. Equipment and material shall be delivered to the job site in their original containers with labels intact, fully identified with manufacturer's name, model, model number, type, size, capacity and Underwriter's Laboratories, Inc. labels and other pertinent information necessary to identify the item.

C. Deliver, receive, handle and store equipment and materials at the job site in the designated area and in such a manner as to prevent equipment and materials from damage and loss. Store equipment and materials delivered to the site on pallets and cover with waterproof, tear resistant tarp or plastic or as required to keep equipment and materials dry. Follow manufacturer's recommendations, and at all times, take every precaution to properly protect equipment and material from damage, to include the erection of temporary shelters to adequately protect equipment and material stored at the Site. Equipment and/or material which become rusted or damaged shall be replaced or restored by the Contractor to a condition acceptable to the Architect.

D. The Contractor shall be responsible for the safe storage of his own tools, material and equipment.

1.017 GUARANTEES AND WARRANTIES

A. Refer to Division 1 and General Conditions for Guarantees and Warranties in addition to requirements specified herein.

B. Furnish service and maintenance of fire protection system for one year from date of substantial completion.

C. Each system and element thereof shall be warranted against defects due to faulty workmanship, design or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in the Construction Documents or manufacturer's standard warranty. The Contractor shall remedy defects occurring within a period of one year from the date of Substantial Completion or as stated in the General Conditions.

D. The following additional items shall be guaranteed:

1. Piping shall be free from obstructions, holes or breaks of any nature.
2. Proper sloping of pipe to drain in each piping system per NFPA 13.

E. The above guarantees shall include labor (including travel expenses), troubleshooting and material; and repairs or replacements shall be made without additional cost to the Owner.

F. The remedial work shall be performed promptly, upon written notice from the Architect or Owner.

G. At the time of Substantial Completion, deliver to the Owner warranties with terms extending beyond the one year guarantee period, each warranty instrument being addressed and stating the commencement date and term.

1.018 PROJECT CONDITIONS

A. Conditions Affecting Excavations: The following project conditions apply:

1. Maintain and protect existing building services which transit the area affected by selective demolition.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.
3. Use of explosives is not permitted.

B. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits permitted by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

PART 2 - PRODUCTS AND MATERIALS

2.01 GENERAL

A. Electrical Contractors shall provide all motors, starters, disconnects, wire, conduit, etc. as specified in the Construction Documents. If, however, the Fire Suppression Contractor furnishes a piece of equipment requiring a different motor, starter, disconnect, wire size, etc. than what is shown and/or intended on the Construction Documents, the Fire Suppression Contractor shall coordinate the requirements with any other Contractor and shall be responsible for any additional cost incurred by any other Contractor that is associated with installing the different equipment and related accessories for proper working condition.

B. Refer to Division 26, "Common Work Results for Electrical" for specification of motor connections.

C. Refer to Division 26, "Enclosed Switches and Circuit Breakers" for specification of disconnect switches.

D. Refer to Division 28, "Fire Detection and Alarm" for specification of sprinkler monitoring equipment connections.

E. All fire protection equipment shall be UL listed for its intended use and in conformance with the applicable NFPA codes.

F. System Pressures: All system components shall be listed for the actual designed system pressures.

1. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

2.02 SOIL MATERIALS

A. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.

B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2-inch sieve, and not more than 5 percent passing a No. 4 sieve.

C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP; free of clay, rock, or gravel larger than 2 inches in any dimension; debris; waste; frozen materials; and vegetable and other deleterious matter.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall install, and test all new equipment identified in this contract and revise existing equipment as noted.

B. Installation shall be in accordance with NFPA requirements and the Contractor shall have employed or enlist the design services of at least one minimum NICET Level II certified technician.

C. Installer: Company specializing in the products indicated in this section with minimum three years documented experience. Shall be bondable and licensed contractor and employ full-time factory-trained and certified installers and technicians. Installers shall provide with the fire sprinkler submittal proof of factory training for each installer.

D. The Contractor shall provide all required equipment, sprinklers and piping for a complete and operational fire protection system. All components shall be installed in accordance with the guidelines of these specifications and documents as well as the NFPA codes and standards listed in these specifications.

E. The General Contractor is the central authority governing the total responsibility of all trade contractors. Therefore, deviations and clarifications of this schedule are permitted provided the General Contractor assumes responsibility to coordinate the

trade contractors different than as indicated herein. If deviations or clarifications to this schedule are implemented, submit a record copy to the Engineer.

3.02 PERMITS

A. Secure and pay for permits required in connection with the installation of the Fire Suppression Work. Arrange with the various utility companies for the installation and connection of required utilities for this facility and pay charges associated therewith including connection charges and inspection fees, except where these services or fees are designated to be provided by others.

3.03 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Section.

B. Report test results promptly and in writing.

3.04 EXCAVATION AND BACKFILLING

A. Perform excavation of every description, of whatever substance encountered and to the depth required in connection with the installation of the work under this Division. Excavation shall be in conformance with applicable Division and section of the General Specifications.

B. Roads, alleys, streets and sidewalks damaged during this work shall be restored to the satisfaction of Authorities Having Jurisdiction.

C. Trenches close to walks or columns shall not be excavated without prior consultation with the Architect.

D. The Contractor shall erect barricades around excavations, for safety, and shall place an adequate number of amber lights on or near the work and shall keep them burning from dusk to dawn. The Contractor shall be held responsible for any damage that any parties may sustain in consequence of neglecting the necessary precautions in prosecuting the work.

E. Slope sides of excavations to comply with local, state and federal codes and ordinances. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local, state and federal codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

1. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.

F. Install sediment and erosion control measures in accordance with local codes and ordinances.

G. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches. In no case shall sewers be used as drains for such water.

H. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.
2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.

I. Trenching: Excavate trenches for Fire Suppression installations as follows:

1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of pipe and equipment.
2. Excavate trenches to depth indicated or required for piping to establish indicated slope and invert elevations. Beyond building perimeter, excavate trenches to an elevation below frost line.
3. Limit the length of open trench to that in which pipe can be installed, tested, and the trench backfilled within the same day.
4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of pipe. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and pipe.
5. Excavate trenches for piping and equipment with bottoms of trench to accurate elevations for support of pipe and equipment on undisturbed soil.

    a) For pipes or equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom 1/4 of the circumference. Fill unevenness with tamped sand backfill. At each pipe joint over-excavate to relieve the bell or pipe joint of the pipe of loads, and to ensure continuous bearing of the pipe barrel on the bearing surface.

J. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.

K. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.
2. Under building slabs, use drainage fill materials.
3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
4. For piping less than 30 inches below surface of roadways, provide 4-inch-thick concrete base slab support. After installation and testing of piping, provide a 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.
5. Other areas, use excavated or borrowed materials.

L. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and locations of underground utilities have been recorded.
2. Removal of concrete formwork.
3. Removal of shoring and bracing, and backfilling of voids.
4. Removal of trash and debris.

M. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

N. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

O. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of piping and equipment by carrying material uniformly around them to approximately same elevation in each lift.

P. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

a) Areas under structures, building slabs, steps, and pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.

b) Areas under walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.

c) Other areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

Q. Subsidence: Where subsidence occurs at Fire Suppression installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.05 CUTTING AND PATCHING

A. The Contractor shall do necessary cutting of walls, floors, ceilings and roofs.

B. No structural member shall be cut without permission from Architect and Structural Engineer.

C. Patch around openings to match adjacent construction.

D. After the final waterproofing membrane has been installed, roofs may be cut only with written permission by the Architect.

3.06 CLEANING

A. Dirt and refuse resulting from the performance of the work shall be removed from the premises as required to prevent accumulation. The Fire Suppression Contractor shall cooperate in maintaining reasonably clean premises at all times.

B. Immediately prior to the final inspection, the Fire Suppression Contractor shall clean material and equipment installed under the Fire Suppression Contract. Dirt, dust, plaster, stains, and foreign matter shall be removed from surfaces including components internal to equipment. Damaged finishes shall be touched-up and restored to their original condition.

3.07 SUBSTANTIAL COMPLETION REVIEW

A. Prior to requesting inspection for "CERTIFICATE OF SUBSTANTIAL COMPLETION", the Contractor shall complete the following items:

1. Submit complete Operation and Maintenance Manuals.
2. Submit complete Record Drawings.
3. Perform special inspections.
4. Start-up testing of systems.
5. Removal of temporary facilities from the site.
6. Comply with requirements for Substantial Completion in the "General Conditions".

B. The Contractor shall request in writing a review for Substantial Completion. The Contractor shall give the Architect/Engineer at least seven (7) days notice prior to the review.

C. The Contractor's written request shall state that the Contractor has complied with the requirements for Substantial Completion.

D. Upon receipt of a request for review, the Architect/Engineer will either proceed with the review or advise the Contractor of unfulfilled requirements.

E. If the Contractor requests a site visit for Substantial Completion review prior to completing the above mentioned items, they shall reimburse the Architect/Engineer for time and expenses incurred for the visit.

F. Upon completion of the review, the Architect/Engineer will prepare a "final list" of outstanding items to be completed or corrected for final acceptance.

G. Omissions on the "final list" shall not relieve the Contractor from the requirements of the Contract Documents.

H. Prior to requesting a final review, the Contractor shall submit a copy of the final list of items to be completed or corrected. He shall state in writing that each item has been completed, resolved for acceptance or the reason it has not been completed.

END OF SECTION

SUBSTITUTION REQUEST FORM

To Project Engineer: _____ Request # (GC Determined): _____

Project Name: _____

Project No/Phase: _____ Date: _____

Specification Title: _____

Section Number: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

_____

Manufacturer: _____ Model No.: _____

Address: _____ Phone: _____

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified Work: _____

_____

☐ Point-by-point comparative data attached – REQUIRED BY ENGINEER
Comparative data may include but not be limited to performance, certifications, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements. Include all information necessary for an evaluation.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other: _____

Reason for not providing specified item: _____

_____

Similar Installation:
Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain: _____

_____

_____

Substitution Certification Statement:

Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, and Owner that the:

A. Proposed substitution has been fully investigated and determined to meet or exceed the specified Work in all respects.
B. Proposed substitution is consistent with the Contract Documents and will produce indicated results.
C. Proposed substitution does not affect dimensions and functional clearances.
D. Proposed substitution has received necessary approvals of authorities having jurisdiction.
E. Same warranty will be furnished for proposed substitution as for specified Work.
F. Same maintenance service and source of replacement parts, as applicable, is available.
G. Proposed substitution will not adversely affect other trades or delay construction schedule.
H. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitting Contractor	Date	Company

Manufacturer's Certification of Equal Quality:

I _____ represent the manufacturer of the Proposed Substitution item and hereby certify and warrant to Architect, Engineer, and Owner that the function and quality of the Proposed Substitution meets or exceeds the Specified Item.

Manufacturer's Representative	Date	Company

Engineer Review and Recommendation Section

Recommend Acceptance	☐ Yes	☐ No
Additional Comments:	☐ Attached	☐ None

Acceptance Section:

Contractor Acceptance Signature	Date	Company
Owner Acceptance Signature	Date	Company
Architect Acceptance Signature	Date	Company
Engineer Acceptance Signature	Date	Company

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PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section includes limited scope general construction materials and methods for application with Fire Suppression installations as follows:

1. Access panels and doors in walls, ceilings, and floors for access to Fire Suppression materials and equipment.
2. Concrete for bases and housekeeping pads.
3. Non-shrink grout for equipment installations.
4. Miscellaneous metals for support of Fire Suppression materials and equipment.
5. Wood grounds, nailers, blocking, fasteners, and anchorage for support of Fire Suppression materials and equipment.
6. Joint sealers for sealing around Fire Suppression materials and equipment.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 7 Section “Penetration Firestopping” for material and methods for firestopping systems.
2. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, fire flow test data, obtaining electronic drawings files, shop drawings and record drawings.
3. Division 21 Section 210515 "Basic Fire Suppression Piping Material and Methods," for general piping and fitting materials and methods.
4. Division 21 Section 210533 “Heat Tracing for Fire-Suppression Piping” for heat tracing requirements.
5. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.
6. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.
7. Division 21 Section 211200 "Fire Suppression Standpipes" for fire suppression standpipes inside the building.
8. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire suppression sprinkler systems inside the building.

1.02 SUBMITTALS

A. General: Submit the following in accordance with Division 1 and Division 21 Section “General Fire Suppression Requirements”.

1. Product data for the following products:

a) Access panels and doors.
b) Through and membrane-penetration firestopping systems.

2. Schedules indicating proposed methods and sequence of operations for selective demolition prior to commencement of Work. Include coordination for shut-off of utility services and details for dust and noise control.

a) Coordinate sequencing with construction phasing and Owner occupancy specified in Division 1 Section "Summary of Work."

1.03 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating shown.

1. Provide UL Label on each fire-rated access door.

PART 2 - PRODUCTS AND MATERIALS

2.01 ACCESS TO EQUIPMENT

A. Acceptable Manufacturers:

1. Bar-Co., Inc.
2. Elmdor Stoneman.
3. JL Industries
4. Jay R. Smith Mfg. Co.
5. Karp Associates, Inc.
6. Milcor
7. Nystrom Building Products
8. Wade
9. Zurn

B. Access Doors:

1. Provide access doors for all concealed equipment, except where above lay-in ceilings. Refer to Section “Identification for Fire Suppression Piping and Equipment” for labeling of access doors.
2. Access doors shall be adequately sized for the devices served with a minimum size of 18 inches x 18 inches, furnished by the respective Contractor or Subcontractor and installed by the General Contractor.
3. Access doors must be of the proper construction for type of construction where installed.
4. The exact location of all access doors shall be verified with the Architect prior to installation.
5. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation.

Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.

6. Frames: 16-gauge steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling.

    a) For installation in masonry, concrete, ceramic tile, or wood paneling: 1-inch-wide exposed perimeter flange and adjustable metal masonry anchors.
    b) For installation in gypsum wallboard or plaster: perforated flanges with wallboard bead.
    c) For installation in full-bed plaster applications: galvanized, expanded metal lath and exposed casing bead, welded to perimeter of frame.

7. Flush Panel Doors: 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.

    a) Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.

8. Locking Devices: Flush, screwdriver-operated cam locks.

2.02 FIRE SUPPRESSION EQUIPMENT NAMEPLATE DATA

A. For each piece of power operated Fire Suppression equipment, provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance's, and similar essential data. Locate nameplates in an accessible location.

2.03 MISCELLANEOUS METALS

A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Hot-Rolled Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Schedule 40, welded.

E. Fasteners: Zinc-coated, type, grade, and class as required.

2.04 MISCELLANEOUS LUMBER

A. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be

preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.

1. Framing materials shall be fire resistant treated for use in Type I and II buildings.

B. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than 15/32 inches.

1. Framing materials shall be fire resistant treated for use in Type I and II buildings.

2.05 JOINT SEALERS

A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.

B. Colors: As selected by the Architect from manufacturer's standard colors.

C. Elastomeric Joint Sealers: Provide the following types:

1. One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer. Provide one of the following:

a) "Dow Corning 790," Dow Corning Corp.
b) "Silglaze II SCS 2801," General Electric Co.
c) "Silpruf SCS 2000," General Electric Co.
d) "864," Pecora Corp.
e) "Rhodia 5C," Rhone-Poulenc, Inc.
f) "Spectrem 1," Tremco, Inc.
g) "Spectrem 2," Tremco, Inc.
h) "Dow Corning 795," Dow Corning Corp.
i) "Rhodia 7B," Rhone-Poulenc, Inc.
j) "Rhodia 7S," Rhone-Poulenc, Inc.
k) "Omniseal," Sonneborn Building Products Div.

2. One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes. Provide one of the following:

a) "Dow Corning 786," Dow Corning Corp.
b) "Sanitary 1700," General Electric Co.
c) "898 Silicone Sanitary Sealant," Pecora Corp.
d) "OmniPlus," Sonneborn Building Products Div.

D. Acrylic-Emulsion Sealants: One-part, nonsag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent.

1. Products: Subject to compliance with requirements, provide one of the following:

a) "Chem-Calk 600," Bostik Construction Products Div.
b) "AC-20," Pecora Corp.
c) "Sonolac," Sonneborn Building Products Div.
d) "Tremflex 834," Tremco, Inc.

2.06 ACOUSTICAL SEALANTS

A. General: Penetrations by pipes through surfaces that are around and between noise critical spaces shall be sleeved, packed and sealed airtight with foam rod, non-hardening sealant and/or packing material as described herein.

B. Foam Rod: Foam backer rod shall be closed cell polyethylene suitable for use as a backing for non-hardening sealant.

C. Non-Hardening Sealant: Sealant for penetrations shall be non-hardening polysulphide type. Permanently flexible, approved firestop putty may be used in lieu of the sealant on foam rod in noise critical walls that are also fire rated.

D. Packing Material: Mineral fiber; non-combustible; resistant to water, mildew and vermin. Expanding resilient foams manufactured for this purpose are an acceptable alternative only if the material density is at least 15 pcf (40 kg/m3).

PART 3 - EXECUTION

3.01 INSTALLATION OF ACCESS DOORS

A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

B. Adjust hardware and panels after installation for proper operation.

3.02 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor Fire Suppression materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.03 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor Fire Suppression materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.04 PREPARATION FOR JOINT SEALERS

A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.

3.05 APPLICATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

1. Comply with recommendations of ASTM C 962 for use of elastomeric joint sealants.
2. Comply with recommendations of ASTM C 790 for use of acrylic-emulsion joint sealants.

B. Tooling: Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.06 PENETRATIONS:

A. New Construction:

1. Coordinate with Divisions 03 and 04 for installation of sleeves and sleeve seals integrally in cast-in-place, precast, and masonry walls and horizontal slabs where indicated on the Drawings or as required to support piping penetrations.

B. Provide sleeves and/or box frames for openings in all concrete and masonry construction and fire or smoke partitions, for all mechanical work that passes through such construction; Coordinate with other trades and Divisions to dimension and lay out all such openings.

C. The General Contractor will provide only those openings specifically indicated on the Architectural or Structural Drawings as being provided under the General Contractor's work.

D. The cutting of new or existing construction shall not be permitted except by written approval of the Architect.

E. Floor sleeves shall be fitted with means for attachment to forms and shall be of length to extend at least two inches above the floor level.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

H. Seal space outside of sleeves with approved joint compound for penetrations of gypsum board assemblies.

I. All openings sleeved through underground exterior walls shall be sealed with mechanical sleeve seals as specified in Division 21 Section "Basic Fire Suppression Piping Materials and Methods

END OF SECTION

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PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section specifies piping materials and installation methods common to more than one Section of Division 21 and includes piping, joining materials, piping specialties and basic piping installation instructions.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, fire flow test data, obtaining electronic drawings files, shop drawings and record drawings.
2. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.
3. Division 21 Section 210533 “Heat Tracing for Fire-Suppression Piping” for heat tracing requirements.
4. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.
5. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.
6. Division 21 Section 211200 "Fire-Suppression Standpipes" for fire-suppression standpipes inside the building.
7. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire-suppression sprinkler systems inside the building.

1.02 SUBMITTALS

A. Refer to Division 1 and Division 21 “General Fire Suppression Requirements” for administrative and procedural requirements for submittals.

B. Product Data: Submit product data on the following items:

1. Piping and Fittings
2. Escutcheons
3. Dielectric Unions and Fittings
4. Sleeves and Mechanical Sleeve Seals
5. Wall Pipes

1.03 QUALITY ASSURANCE

A. Welding procedures and testing shall comply with ANSI Standard B31.9 - Standard Code for Building Services Piping and The American Welding Society, Welding Handbook.

B. Soldering and Brazing procedures shall conform to ANSI B9.1 Standard Safety Code for Plumbing Refrigeration.

C. Threaded joints shall conform to ASME B1.20.1, Pipe Threads, General Purpose and the Pipe Fitters Handbook.

D. UL Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled for fire service.

E. Pipe, piping specialties and fittings shall be manufactured in plants located in the United States.

PART 2 - PRODUCTS AND MATERIALS

2.01 GENERAL REQUIREMENTS

A. All fire suppression system materials and components essential to successful system operation shall be listed for their intended purpose.

B. General: Refer to the individual piping system specification sections in Division 21 for specifications on piping and fittings relative to that particular system.

2.02 STEEL PIPE AND FITTINGS

A. All piping 2-inch and smaller:

1. With the use of welded or roll grooved fittings: ASTM A135 or 795, Grade A, Schedule 10 or 40, seamless or ERW, black steel pipe.
2. With the use of threaded fittings: ASTM A135 or 795, Grade A, Schedule 40, seamless or ERW, black steel pipe. All 1-inch piping shall have threaded ends.

B. All piping 2-1/2” and larger: ASTM A135 or 795, Grade A, Schedule 10, ERW, black steel pipe, roll grooved ends.

C. Piping used in dry pipe and preaction sprinkler systems shall be ASTM A135 or 795, Type E, Grade A, Schedule 40, black steel pipe, threaded or roll grooved ends.

D. All piping on the exterior of the building shall be externally galvanized.

E. Acceptable alternatives to Schedule 40 and Schedule 10 pipe shall be manufactured to standards recognized by NFPA 13. Threaded pipe shall have a corrosion resistance rating (CRR) of 1.0 or greater. Crimp type couplings shall not be used. Threadable thinwall pipe with CRR less than 1.0 not permitted.

F. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

G. Black Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

H. Steel Couplings: ASTM A 865, threaded

I. Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

J. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

K. Malleable- or Ductile-Iron Unions: UL 860.

L. Cast-Iron Flanges: ASME 16.1, Class 125.

M. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

N. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

O. Grooved-Joint, Steel-Pipe Appurtenances

1. Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
2. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.
3. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service.

2.03 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

E. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.04 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.

2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Plastic, Pipe-Flange Gasket, and Bolts and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.05 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed.
2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.

B. Check Valves:

1. Description: Swing-check type, rubber-face checks unless otherwise indicated, and ends matching piping.
2. Standard: UL 312.
3. Pressure Rating: 250 psig minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:

1. Description: Bronze body and bonnet and bronze stem.
2. Standard: UL 262.
3. Pressure Rating: 175 psig.
4. Body Material: Bronze.
5. End Connections: Threaded or grooved.

D. Iron OS&Y Gate Valves:

1. Description: Iron body and bonnet and bronze seating material.
2. Standard: UL 262.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Cast or ductile iron.
5. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psig minimum.
3. Valves NPS 2 and Smaller:

    a) Valve Type: Ball or butterfly.
    b) Body Material: Bronze.
    c) End Connections: Threaded or grooved.

4. Valves NPS 2-1/2 and Larger:

    a) Valve Type: Butterfly.
    b) Body Material: Cast or ductile iron.
    c) End Connections: Flanged or grooved.

5. Valve Operation: Integral, prewired supervisory switch and visual indicating device.

2.06 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing.
2. Pressure Rating: 175 psig minimum.

B. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175 psig minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4.
5. End Connections: Threaded.

2.07 AUTOMATIC AIR RELEASE VALVE

A. Standard: UL 2573

B. Pressure Rating: 175 psig minimum.

2.08 PIPING SPECIALTIES

A. Escutcheons: Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

1. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
2. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
3. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

4. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

B. Floor Plates: Inside diameter shall closely fit pipe outside diameter. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

1. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
2. Split-Casting Floor Plates: Cast brass with concealed hinge.

C. Unions: Malleable-iron, Class 150 for low pressure service and class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

D. Dielectric Unions and Fittings: Provide factory-fabricated dielectric unions and fittings with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion.

E. Pressure Gauges

1. Standard: UL 393.
2. Dial Size: 3-1/2- to 4-1/2-inch diameter.
3. Pressure Gage Range: 0 to 300 psig.
4. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
5. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

2.09 PENETRATIONS

A. Sleeves:

1. Steel Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A-53 grade A or 12 gauge (0.1084 inches) welded galvanized steel formed to a true circle concentric to the pipe.
2. Sheet-Metal Sleeves: 10 gauge (0.1382 inches), galvanized steel, round tube closed with welded longitudinal joint.
3. Frames for rectangular openings attached to forms and of a maximum dimension established by the Architect. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, provide 18 gauge (0.052 inches) welded galvanized steel. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, provide 10 gauge (0.1382 inches) welded galvanized steel. Notify the General Contractor or Architect before installing any box openings not shown on the Architectural or Structural Drawings.
4. Box Frames: Frames for rectangular openings shall be of welded 12 gauge steel attached to forms and of a maximum dimension established by the Architect. Contractor shall notify the General Contractor or Architect

before installing any box openings not shown on the Architectural or Structural Drawings.

B. Wall Pipes

1. Cast-iron sleeve with integral clamping flange with clamping ring, bolts, and nuts for membrane flashing.

a) Underdeck Clamp: Clamping ring with setscrews.

C. Mechanical Sleeve Seals: Modular Plumbing type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

a) Pressure Plates: Carbon steel or stainless steel.
b) Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.02 PIPING INSTALLATIONS

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for coordination drawing submittals.

B. Coordinate installation of horizontal piping with other components. Allow sufficient space above removable ceiling panels to allow for panel removal (minimum 6” clearance).

C. Install system such that all piping is rigidly secured and supported. All ductwork, lights, structural members and main runs of piping shall take precedence over sprinkler piping. Cutting of structural members for passage of sprinkler pipes or

hangers shall not be permitted. All horizontal piping in ceiling space shall be at an elevation above the top of light fixtures and air outlets to allow for access to light fixtures and air outlets without removing horizontal piping. Route all sprinkler piping and provide all offsets, bends, and elbows around all mechanical, electrical, and structural members as required.

D. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated otherwise. In areas with ceilings, piping shall be routed concealed, above ceiling. In areas without ceilings, piping shall extend as high as possible.

E. Install piping free of sags and bends and with ample space between piping to permit proper insulation applications.

F. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated on the Drawings.

G. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

H. Support piping from structure. Do not support piping from ceilings, equipment, ductwork, conduit and other non-structural elements.

I. Install sprinkler piping to provide for system drainage in accordance with NFPA 13. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple and cap.

J. Coordinate pipe routing near electrical equipment in accordance with NFPA 70.

K. Verify final equipment locations for roughing in.

L. Deviations from approved "Working Plans" for sprinkler piping require written approval of the Authority Having Jurisdiction. Written approval shall be on file with the Engineer prior to deviating from the approved "Working Plans."

M. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors.

3.03 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

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

C. Install unions in pipes NPS 2 and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.

D. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

E. Install dielectric unions to connect piping materials of dissimilar metals in dry piping systems.

F. Non-ferrous Pipe Joints:

1. Brazed and Soldered Joints: For copper tube and fitting joints, braze joints in accordance with ANSI B31.9 - Standard Code for Building Services Piping.
2. Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emery cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.

G. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

a) Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

H. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads and Pipe Fitter's Handbook. Join pipe, fittings, and valves as follows:

1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
2. Align threads at point of assembly.
3. Apply appropriate tape or thread compound to the external pipe threads.
4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
5. Damaged Threads: Do not use pipe with threads that are corroded, or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

I. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9. Align flanged surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

J. Mechanical Grooved Joints: Roll grooves on pipe ends dimensionally compatible with the couplings. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

K. Joints for other piping materials are specified within the respective piping system sections.

3.04 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision.

B. Supervisory Switches: Supervise valves in open position unless noted otherwise.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

C. Locking and Sealing: Secure unsupervised valves as follows:

1. Valves: Install chain and padlock on open OS&Y gate valve.
2. Post Indicators: Install padlock on wrench on indicator post.

D. Water-Flow Indicators: Install in fire suppression piping where indicated. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.

E. Connect alarm devices to building's fire-alarm system. Wiring and fire-alarm devices are specified in Division 28 Sections.

3.05 PIPING PROTECTION

A. Protect piping during construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at the end of each day or whenever work stops.

3.06 PENETRATIONS

A. Fire suppression penetrations occur when piping penetrate concrete slabs, concrete or masonry walls, or fire / smoke rated floor and wall assemblies.

B. Above Grade Concrete or Masonry Penetrations

1. Provide sleeves for pipes passing through above grade concrete or masonry walls, concrete floor or roof slabs. Sleeves are not required for core drilled holes in existing masonry walls, concrete floors or roofs. Provide sleeves as follows:

a) Provide schedule 40 galvanized steel pipe for sleeves smaller than 6 inches in diameter.
b) Provide galvanized sheet metal for sleeves 6 inches in diameter and larger, thickness shall be 10 gauge (0.1382 inches).
c) Provide welded galvanized sheet metal for rectangular sleeves with the following minimum metal thickness:

1) For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 18 gauge (0.052 inches).
2) For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 10 gauge (0.1382 inches).

d) Schedule 40 PVC pipe sleeves are acceptable for use in areas without return air plenums.

2. Seal elevated floor, exterior wall and roof penetrations watertight and weathertight with non-shrink, non-hardening commercial sealant. Pack with mineral wool and seal both ends with minimum of ½" of sealant.

C. Underground, Exterior-Wall Penetrations: Install cast-iron wall pipes for sleeves. Size sleeves to allow for 1-inch (or larger, if required by the mechanical sleeve manufacturer) annular clear space between pipe and sleeve. Provide mechanical sleeve seal.

1. Use type and number of sealing elements recommended by manufacturer for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
2. Inspect installed sleeve and sleeve-seal installations for damage and faulty work. Verify watertight integrity of sleeves and seals installed below grade to seal against hydrostatic pressure.

D. Elevated Floor Penetrations of Waterproof Membrane:

1. Provide cast-iron wall pipes for sleeves, extend top of wall pipe minimum 1" above finish floor. Size wall pipe for minimum ½" annular space between pipe and wall pipe.
2. Extend pipe insulation for insulated pipe through wall pipe. The vapor barrier shall be maintained. Size wall pipe for a minimum of 1" annular clear space between inside of sleeve and outside of insulation.
3. Pack with mineral wool and seal both ends with minimum of ½" of waterproof sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.

4. Secure waterproof membrane flashing between clamping flange and clamping ring. Comply with requirements for flashing specified in Division 7 Section "Sheet Metal Flashing and Trim."

5. Extend bottom of wall pipe below floor slab as required and secure underdeck clamp to hold wall pipe rigidly in place.

E. Interior Foundation Penetrations: Provide sleeves for horizontal pipe passing through or under foundation. Sleeves shall be cast iron soil pipe two nominal pipe sizes larger than the pipe served.

F. Concrete Slab on Grade Penetrations:

1. Provide schedule 40 PVC pipe sleeves for vertical pressure pipe passing through concrete slab on grade. Sleeves shall be one nominal pipe size larger than the pipe served and two pipe sizes larger than pipe served for ductile iron pipes with restraining rods. Seal water-tight with silicone caulk.
2. Provide 1/2-inch thick cellular foam insulation around perimeter of non-pressure pipe passing thru concrete slab on grade. Insulation shall extend to 2-inch above and below the concrete slab.

G. Interior Penetrations of Non-Fire-Rated Walls: Seal annular space between sleeve and pipe or duct, using joint sealant appropriate for size, depth, and location of joint. Pack with mineral wool and seal both ends with minimum of 1/2-inch of sealant. Refer to Division 21 Section "Common Work Results for Fire Suppression" for materials and installation.

1. Extend pipe insulation for insulated pipe through sleeve. The vapor barrier shall be maintained. Size sleeve for a minimum of 1-inch annular clear space between inside of sleeve and outside of insulation.

H. Exterior Wall Penetrations: Seal annular space between sleeve and pipe or duct, using joint sealant appropriate for size, depth, and location of joint. Pack with mineral wool and seal both ends with minimum of 1/2-inch of waterproof sealant. Refer to Division 07 Section "Joint Sealants" for materials and installation.

1. Extend pipe insulation for insulated pipe through sleeve. The vapor barrier shall be maintained. Size sleeve for a minimum of 1-inch annular clear space between inside of sleeve and outside of insulation.

I. Fire / Smoke Rated Floor and Wall Assemblies: Seal around penetrations of fire rated assemblies to maintain fire resistance rating of assemblies. Coordinate fire ratings and locations with the architectural drawings. Install sealants in compliance with the manufacturer’s UL listing. Refer to Division 21 Section “Common Work Results for Fire Suppression” for firestopping and materials.

3.07 ACOUSTICAL PENETRATIONS

A. General: There shall be no direct contact of piping with shaft walls, floor slabs and/or partition. All openings around pipes in the structure surrounding the Fire Suppression equipment and surrounding noise-critical spaces shall be sealed, packed with caulking for the full depth of the penetration, as described herein. This includes all slab penetrations and penetrations of noise critical walls.

B. Fire Sprinkler Piping

1. Where a pipe passes through a wall, ceiling or floor slab of a noise critical space, a steel sleeve shall be cast or grouted into the structure. The internal diameter of the sleeve shall be 2 inches larger than the external diameter of the pipe passing through it. After all of the piping is installed in that area, the Contractor shall check the clearance and correct it, if necessary, to within 1/2 inch. Pack the void full depth with packing material sealed at both ends, 1 inch deep, with non-hardening sealant backed by foam rod.

3.08 PIPE FIELD QUALITY CONTROL

A. Testing: Refer to individual piping system specification sections.

END OF SECTION

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes heat tracing with the following electric heating cables:

1. Self-regulating, parallel resistance.

B. Related Sections include the following:

1. Division 22 Section "Heat Tracing for Plumbing Piping."

1.03 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.

1. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable. Include plans, sections, details, and attachments to other work.

1. Wiring Diagrams: Power, signal, and control wiring.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

B. Warranty: Special warranty specified in this Section.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

1.06 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.07 WARRANTY

A. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. BH Thermal Corporation.
2. Chromalox, Inc.; Wiegard Industrial Division; Emerson Electric Company.
3. Delta-Therm Corporation.
4. Easy Heat Inc.
5. Nelson Heat Trace.
6. Pyrotenax; a division of Tyco Thermal Controls.
7. Raychem; a division of Tyco Thermal Controls.
8. Thermon Manufacturing Co.
9. Trasor Corp.

B. Heating Element: Pair of parallel No. 16 or 18 AWG, nickel-coated stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

C. Electrical Insulating Jacket: Flame-retardant polyolefin.

D. Cable Cover: Stainless-steel braid, and polyolefin outer jacket with UV inhibitor.

E. Maximum Operating Temperature (Power On): 150 deg F. Verify temperature of circulated media in freeze-protected piping in first paragraph below.

F. Maximum Exposure Temperature (Power Off): 185 deg F.

G. Maximum Operating Temperature: 300 deg F.

2.02 CONTROLS

A. Remote bulb unit with adjustable temperature range from 30 to 50 deg F.

B. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.

C. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.

D. Corrosion-resistant, waterproof control enclosure.

2.03 ACCESSORIES

A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

B. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 4 Inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install electric heating cable across expansion joints according to manufacturer's written recommendations using slack cable to allow movement without damage to cable.

B. Install electric heating cables after piping has been tested and before insulation is installed.

C. Install electric heating cables according to IEEE 515.1.

D. Install insulation over piping with electric cables according to manufacturer’s specifications.

E. Install warning tape on piping insulation where piping is equipped with electric heating cables.

F. Set field-adjustable switches and circuit-breaker trip ranges.

G. Protect installed heating cables, including nonheating leads, from damage.

3.03 CONNECTIONS

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

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

3.04 FIELD QUALITY CONTROL

A. Testing: Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.

1. Test cables for electrical continuity and insulation integrity before energizing.
2. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

B. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounting cables.

C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

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PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. Extent of Fire Suppression work to be identified as required by this Section is indicated on drawings and/or specified in other Division 21 Sections.

B. Types of identification devices specified in this Section include the following:

1. Equipment labels.
2. Valve tags.
3. Hydraulic placards.

C. Related Sections

1. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, fire flow test data, obtaining electronic drawings files, shop drawings and record drawings.
2. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.
3. Division 21 Section 210515 "Basic Fire Suppression Piping Material and Methods," for general piping and fitting materials and methods.
4. Division 21 Section 210533 “Heat Tracing for Fire-Suppression Piping” for heat tracing requirements.
5. Division 21 Section 211100 "Fire Suppression Water Service Piping," for fire suppression piping starting 5 feet outside the building to within the building.
6. Division 21 Section 211200 "Fire-Suppression Standpipes" for fire-suppression standpipes inside the building.
7. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire-suppression sprinkler systems inside the building.

1.02 CODES AND STANDARDS:

A. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

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

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

B. Maintenance Data: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, aluminum, or anodized aluminum, 0.032 inch thick, with predrilled holes for attachment hardware.
2. Background/Letter Color: Red/White or Bare Metal/Black.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
2. Background/Letter Color: Red/White
3. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number,

2.02 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping-system abbreviation and 1/2-inch (13-mm) numbers.

1. Tag Material: Brass, stainless steel, aluminum or anodized aluminum, 0.032 inch thick, with predrilled holes for attachment hardware.
2. Fasteners: Brass wire-link chain, beaded chain or S-hook.
3. Valve-Tag Color: Red.
4. Letter Color: White.

2.03 HYDRAULIC PLACARDS

A. Provide hydraulic calculation placard attached to each riser in accordance with NFPA 13. Placard shall include location of design area or areas, discharge densities over the design area or areas, required flow and pressures at the base of riser, occupancy classification and maximum permitted storage height and configuration, hose stream allowance included in addition to the sprinkler demand and name of installing contractor. Information shall be permanently and clearly displayed on placard.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT IDENTIFICATION

A. General: Install metal or plastic equipment marker on or near each major item of fire protection equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:

1. Backflow Preventers

3.03 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in fire suppression systems

3.04 LABEL INSTALLATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install or permanently fasten labels on each major piece of equipment.

D. Locate equipment labels where accessible and visible.

E. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."

END OF SECTION

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PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. The extent of this fire suppression water service piping shall be as specified herein. Contractor shall be responsible for preparation of design drawings, fabrication and installation for complete fire suppression water service piping for the building.

B. This section specifies:

1. Materials and equipment for fire suppression water service piping and related components starting 5-feet outside the building and the following:

    a) Service entrance piping through floor into the building.

C. This section includes:

1. Pipe and fittings
2. Valves
3. Backflow preventers
4. Fire department connection
5. Alarm devices
6. Accessories

D. Provide facility fire suppression water service piping during construction in accordance with code.

E. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 21 Specifications Sections, apply to this section.

F. Related Sections:

1. Division 31 Section "Earthwork," for trenching and backfilling materials and methods for underground piping installations.
2. Division 33 Section "Water Service Systems," for water service piping beginning from 5'-0" outside the building and extending to the water service line.
3. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, fire flow test data, obtaining electronic drawings files, shop drawings and record drawings.
4. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.
5. Division 21 Section 210533 “Heat Tracing for Fire-Suppression Piping” for heat tracing requirements.
6. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.

7. Division 21 Section 211200 "Fire Suppression Standpipes" for fire suppression standpipes inside the building.
8. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire suppression sprinkler systems inside the building.

1.02 SUBMITTALS

A. Submit shop drawings prepared in accordance with Division 21 Section 210010 “General Fire Suppression Requirements.”

B. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.03 QUALITY ASSURANCE

A. Contractor shall be responsible for all permits and fees associated with preparation and approval of Drawings and the installation and approval of the Facility Fire Suppression Water Service Piping.

B. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for fire suppression water service piping, including materials, hose threads, installation, and testing.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

D. NFPA 24, “Private Fire Service Mains and their Appurtenances”, Latest Edition. Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire suppression water service piping.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.

2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

PART 2 - PRODUCTS AND MATERIALS

2.01 GENERAL

A. Refer to Division 21 Section 210515 "Basic Fire Suppression Piping Materials and Methods" for general piping fittings and piping specialty requirements.

2.02 DUCTILE-IRON PIPE AND FITTINGS.

A. Mechanical-Joint, Cement Lined Ductile-Iron Pipe: AWWA C151/C104, with mechanical-joint bell and plain spigot end.

B. Mechanical-Joint, Cement Lined Ductile-Iron Fittings: AWWA C110/C104, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Flanges: ASME B16.1, Class 125, cast iron.

D. Ductile-Iron Deflection Fittings:

1. Description: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
2. Pressure Rating: 250 psig minimum.

2.03 SERVICE ENTRANCE ASSEMBLY

A. At Contractor's option, the service entrance is permitted to utilize a one-piece riser assembly to enter the building.

1. Assembly shall be Ames Fire and Waterworks Series IBR or approved equivalent. In-Building Riser shall be composed of a single extended 90 degree fitting of fabricated 304 stainless steel tubing, maximum working pressure 200 psi. The fitting shall have a grooved-end connection on the outlet (building) side and a CIPS coupler on the inlet (underground) side. The grooved end shall include a coupler and cap to facilitate testing of the underground piping.

2.04 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density PE film of 0.008-inch (0.20-mm) or High-density, cross-laminated PE film of 0.004-inch (0.10-mm) minimum thickness.

C. Form: Sheet or tube.

2.05 CURB VALVES

A. Curb Valves: Comply with AWWA C800 for high pressure service line valves. Valve has bronze body, ground-key plug or ball, wide tee head, and inlet and outlet matching service piping material.

B. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.

1. Shutoff Rods: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

C. Meter Valves: Comply with AWWA C800 for high pressure service line valves. Include angle- or straight-through-pattern bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

2.06 GATE VALVES

A. UL Listed Gate Valves:

1. UL listed, Iron, Non-rising Stem Gate Valves:

a) Description: Iron body and bonnet, bronze seating material, and inside screw.
b) Standards: UL 262 listing.
c) Pressure Rating: 175 psig minimum.

d) End Connections: Mechanical or push-on joint.
e) Indicator-Post Flange: Include on valves used with indicator posts.

2. UL-Listed, Iron, OS&Y, Gate Valves:

a) Description: Iron body and bonnet and bronze seating material.
b) Standards: UL 262 listing.
c) Pressure Rating: 175 psig minimum.
d) End Connections: Flanged or grooved.

2.07 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5-inches (125 mm) in diameter.

1. Operating Wrenches: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.08 CHECK VALVES

A. UL listed Check Valves:

1. Description: Swing-check type with pressure rating, rubber-face checks unless otherwise indicated, and ends matching piping.
2. Standards: UL 312 listing.
3. Pressure Rating: 175 psig minimum.

2.09 BACKFLOW PREVENTERS

A. Double Check Detector Backflow Preventer Assembly:

1. Standards: ASSE 1048 and UL's "Fire Protection Equipment Directory" listing.
2. Operation: Continuous-pressure applications.
3. Body Material: Cast iron with interior lining complying with AWWA C550 or that is FDA approved; Steel with interior lining complying with AWWA C550 or that is FDA approved; or Stainless steel.
4. End Connections: Threaded, flanged or grooved.
5. Accessories:

a) Supervised butterfly or OS&Y gate valves. Backflow preventer and valves shall be listed as an assembly.
b) Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

2.010 FIRE DEPARTMENT CONNECTION

A. Description: Freestanding, Siamese-type with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose connection inlet; 18-inch high brass sleeve; and round escutcheon plate.

1. Standard: UL 405.
2. Connections: Four NPS 2-1/2 inlets and one NPS 6 outlet.
3. Inlet Alignment: Inline.
4. Finish Including Sleeve: Rough bronze.
5. Caps: Rough bronze.
6. Escutcheon Plate Marking: "AUTO SPKR & STANDPIPE" as applicable.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."

3.02 PREPARATION FOUNDATION FOR BELOW GROUND WATER DISTRIBUTION PIPE AND FITTINGS

A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated elevation.

C. Pipe Beds:

1. Ductile Iron Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation. Provide first layer of pea gravel backfill 6-inch above pipe, tamp backfill with mechanical tamper to 85% to 95% compaction. For piping with rock trench bottoms, provide sand pipe bed 6-inch underneath and around sides of pipe up to middle half of the pipe, including fittings.

D. Provide backfill above top of pipe bed as required for field conditions. Refer to Division 21 Section 210010 "General Fire Suppression Requirements" for materials and methods for backfill.

3.03 PIPE APPLICATIONS

A. Piping below grade: Provide cement lined ductile iron pipe and fittings with mechanical joints.

3.04 PIPING INSTALLATION

A. Comply with NFPA 24 for fire service main piping materials and installation.

B. Water main connection: Arrange with water utility company for tap of size and in location indicated in water main or tap water main according to the requirements of the water utility company.

C. Install ductile-iron, water service piping according to AWWA C600 and AWWA M41.

1. Install encasement for piping according to ASTM A 674 or AWWA C105.

D. Bury piping with depth of cover over top of piping at least 30-inches, with top at least 12-inches below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 36-inches of cover over top.
2. Under Railroad Tracks: With at least 48-inches of cover over top.

E. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

F. Extend fire suppression water service piping and connect to water supply source and building fire suppression water service piping systems at locations and pipe sizes indicated.

1. Terminate fire suppression water service piping at building floor slab until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire suppression water service piping systems when those systems are installed.

G. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

H. Comply with requirements in Section 211200 "Fire Suppression Standpipes," and Section 211313 "Water-Based Fire Suppression Systems," for fire suppression water piping inside the building.

I. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210515 "Basic Fire Suppression Piping Materials and Methods."

J. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210515 "Basic Fire Suppression Piping Materials and Methods."

K. Make connections between underground and aboveground piping using an approved transition piece strapped or fastened to prevent separation.

3.05 JOINT CONSTRUCTION

A. See Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general joint construction requirements.

B. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

C. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.

D. Ductile-Iron Piping, Gasketed-Joints for Fire Service Main Piping: UL 194.

E. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

3.06 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Locking mechanical joints.
2. Bolted flanged joints.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire suppression water service piping according to NFPA 24 and the following:

1. Gasketed-Joint, Ductile-Iron, Water Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.07 VALVE INSTALLATION

A. See Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general valve installation requirements.

B. UL-Listed Gate Valves: Comply with NFPA 24. Install each underground valve(s) in vaults with stem pointing up.

C. UL-Listed Valves Other Than Gate Valves: Comply with NFPA 24.

D. Support valves and piping, not direct buried, on concrete piers. Comply with requirements for concrete piers in Division 03.

3.08 BACKFLOW PREVENTER INSTALLATIONS

A. Install backflow preventer at each fire protection entry in compliance with the plumbing code and Authority Having Jurisdiction. Locate in an accessible and testable location.

B. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks.

C. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

D. Do not install bypass piping around backflow preventers.

E. Support NPS 2-1/2 and larger backflow preventers with pipe supports attached to the floor with anchor bolts where indicated on the drawings.

F. Test backflow preventer per requirements of plumbing or division of cross connection control official.

1. Reports: Prepare backflow preventer test reports signed by the plumbing or division of cross connection control official and turn over to the Architect upon completion of the project.

3.09 FIRE DEPARTMENT CONNECTION INSTALLATIONS

A. Install automatic (ball drip) drain valve at each check valve for fire department connection, to drain piping between fire department connection and check valve. Install drain piping to and discharge to outside building.

B. Install connections between 18- and 36-inches above finished grade and as indicated on the Drawings.

C. Install mechanical sleeve seal at pipe penetration in outside walls.

D. Provide minimum 36-inch working clearance around connection for fire department access.

E. Install protective pipe bollards on two sides of each fire department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."

3.010 FIELD QUALITY CONTROL

A. Flush, test, and inspect in accordance with NFPA 24.

B. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.

C. Replace piping system components that do not pass the test procedures specified, and retest repaired portion of the system.

3.011 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for underground fire suppression water service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

3.012 CLEANING

A. Clean fire suppression water service piping as follows:

1. Flush new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use flushing procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

B. Prepare reports of flushing activities.

END OF SECTION

PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. The extent of the fire suppression standpipe system shall be as specified herein. Contractor shall be responsible for preparation of design drawings, hydraulic calculations, fabrication and installation for complete standpipe protection for the building.

B. This section includes:

1. Pipe and fittings
2. Fire protection valves
3. Hose connections
4. Specialties

C. Related Sections:

1. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, obtaining electronic drawings files, shop drawings and record drawings.
2. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.
3. Division 21 Section 210515 "Basic Fire Suppression Piping Material and Methods," for general piping and fitting materials and methods.
4. Division 21 Section 210533 “Heat Tracing for Fire-Suppression Piping” for heat tracing requirements.
5. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.
6. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.
7. Division 21 Section 211313 "Water-based Fire Suppression Systems" for fire-suppression sprinkler systems inside the building.

1.02 DEFINITIONS

A. Standard Pressure Standpipe Piping: Fire suppression standpipe piping designed to operate at working pressure 175-psig maximum.

1.03 SYSTEM DESCRIPTION

A. Manual Wet-Type: Provide a complete manual wet standpipe system as specified herein and as shown on drawings as applicable. The standpipe system shall be connected to a water supply. Piping is wet, but water must be pumped into standpipes through fire department connection to satisfy demand.

1. Fire protection standpipe system is a Class I, Standpipe System with NPS 2-1/2 hose connections to supply water for use by fire departments and those trained in handling heavy fire streams.

1.04 PERFORMANCE REQUIREMENTS

A. Standard Pressure, Fire Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design fire suppression standpipes, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Fire suppression standpipe design shall be approved by authorities having jurisdiction.

1. Minimum residual pressure at required flow at each hose-connection outlet is as follows:

a) NPS 2-1/2 Hose Connections: 100-psig.

2. Maximum residual pressure at required flow at each hose-connection outlet is as follows unless otherwise indicated:

a) NPS 2-1/2 Hose Connections: 175-psig.

D. Provide construction standpipe and fire protection system during construction in accordance with code.

1.05 SUBMITTALS

A. Submit shop drawings prepared in accordance with NFPA 14 and as specified in Division 21 Section 210010 “General Fire Suppression Requirements.”

1.06 QUALITY ASSURANCE

A. Contractor shall be responsible for all permits and fees associated with preparation and approval of Drawings and the installation and approval of fire suppression standpipe system.

B. Tests and Inspections: Arrange, test, and pay for all tests required by code and Authorities Having Jurisdiction.

PART 2 - PRODUCTS AND MATERIALS

2.01 EQUIPMENT

A. All fire protection equipment shall be UL listed for its intended use and in conformance with the applicable NFPA documents.

2.02 PIPE AND FITTING MATERIALS

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for specifications on piping and fittings.

2.03 HANGERS

A. Shall be UL-listed and shall meet requirements of NFPA 14 for type, dimension and location.

2.04 GENERAL DUTY VALVES

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for specifications on general duty valves.

2.05 PIPE FITTINGS

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for specifications on pipe fittings.

2.06 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing.
2. Pressure Rating:
    a) Standard Pressure Piping Specialty Valves: 175-psig minimum.
3. Body Material: Cast- or ductile- iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

2.07 HOSE CONNECTIONS

A. Nonadjustable Valve Hose Connections:

1. Standard: UL 668 hose valve for connecting fire hose.
2. Pressure Rating: 300-psig minimum.
3. Material: Brass or bronze.
4. Size: NPS 1-1/2 or 2-1/2 as indicated.
5. Inlet: Female pipe threads.
6. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
7. Pattern: Angle.
8. Finish: Rough brass or bronze.
9. Clearance: Minimum 12-inch clear radius around outlet to allow for wrench clearance. Provide minimum code required stairway clearance at each hose connection and standpipe.

2.08 ROOF MANIFOLD

A. Freestanding Unit: Rough brass two-way freestanding unit with back inlet and two NPS 2-1/2-inch UL listed rough brass 300 lb. angle valves with brass cap and chain.

1. Size NPS 4 x NPS 2-1/2 x NPS 2-1/2.

2.09 ALARM DEVICES

A. General: Alarm device types shall match piping and equipment connections.

B. Audible/Visual Alarm Notification Appliances (Horn/Strobe):

1. Standard: UL 1971 combination horn and strobe appliance.
2. Horn: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn.
3. Strobes: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch (25-mm) high letters on the lens or housing.
4. Audible/visual notification appliance shall be exterior, weatherproof with weatherproof backbox.
5. Provide engraved lamacoid plate under Bell lettered “Building Fire Standpipe System.”

C. Water Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover.
4. Type: Paddle operated.
5. Pressure Rating: 250-psig.
6. Design Installation: Horizontal or vertical.

D. Pressure Switches:

1. Standard: UL 346.
2. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Pressure Rating: 250-psig.
5. Design Operation: Rising pressure signals water flow.

E. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts and tamperproof cover.
4. Design: Signals that controlled valve is in other than fully open position.

PART 3 - EXECUTION

3.01 EXAMINATION

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

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

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

3.02 WATER SUPPLY CONNECTION

A. Connect fire suppression standpipe piping to water service piping at service entrance into building. Comply with requirements for exterior piping in Division 21 Section 211100 "Fire Suppression Water Service Piping."

3.03 PIPE APPLICATIONS

A. Piping Below Grade: Refer to Division 21 Section 211100 “Fire Suppression Water Service Piping.”

B. Piping Above Grade:

1. Black steel and fittings for all fire sprinkler system piping located inside the building, not exposed to the elements.
2. Externally galvanized piping and fittings shall be used for all fire sprinkler system piping located on the exterior of the building, exposed to the elements.

3.04 PIPING INSTALLATIONS

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general fire suppression standpipe piping installation requirements.

B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire suppression standpipe piping.

C. Hangers and Supports: Comply with the requirements of NFPA 14. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Locate hangers at or directly adjacent to the joist panel points.

D. Install pressure gauges on riser or feed main and at top of each standpipe. Provide pressure gauge with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

E. Install drain valves on standpipes.

1. Extend drain piping to outside of building where the drain is located 60 inches or less above grade and along the exterior of the building.
2. For all other locations, install a male, ¾-inch GHT connection on the discharge side of the drain valve.

F. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

G. Fill wet-type standpipe system piping with water.

H. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section 210515 "Basic Fire Suppression Piping Materials and Methods"

I. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section 210515 "Basic Fire Suppression Piping Materials and Methods."

3.05 PIPE JOINT CONSTRUCTION

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general fire suppression piping joint construction requirements.

3.06 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 14 and authorities having jurisdiction.

B. Install listed fire protection shutoff valves supervised open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Provide supervised control valve at the base of each standpipe.

1. The control valve shall be supervised by the building fire alarm panel.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

3.07 HOSE CONNECTION INSTALLATION

A. Install connections between 36- and 48-inches above the floor, at each intermediate level of each egress stairway and as indicated on the Drawings.

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

C. Install NPS 2-1/2 hose outlet valves with NPS 2-1/2 to NPS 1-1/2 reducing coupling, brass cap and chain at each standpipe outlet for hose connections.

D. Where pressure exceeds 175 PSI at Class I connections, provide NPS 2-1/2 UL listed pressure reducing and shutoff valve with bronze finish with brass cap and chain. Set valve to limit nozzle pressure to 150 PSI.

E. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes. Drain piping shall be routed to the exterior of the building unless noted otherwise.

F. Install wall-mounted-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose.

3.08 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14 and Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment.”

3.09 FIELD QUALITY CONTROL

A. Perform required tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
4. Coordinate with fire alarm tests. Operate as required.
5. Verify that equipment hose threads are same as local fire department equipment.

C. Replace piping system components that do not pass the test procedures specified, and retest repaired portion of the system.

3.010 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves and associated equipment for standpipe system.

3.011 COMMISSIONING

A. Test per NFPA 14, NFPA 25 and local authorities requirements. Submit Contractor’s Material & Test Certificates for Above Ground Piping. Submit certificates of completion to authority having jurisdiction and Owner.

END OF SECTION

PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. The extent of this fire sprinkler system shall be as specified herein. Contractor shall be responsible for preparation of design drawings, hydraulic calculations, fabrication and installation for complete fire sprinkler protection for the building.

B. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire protection valves.
3. Sprinkler pipe fittings.
4. Sprinklers.
5. Alarm devices.

C. Related Sections:

1. Division 21 Section 210010 “General Fire Suppression Requirements” for requirements for hydraulic calculations, obtaining electronic drawings files, shop drawings and record drawings.
2. Division 21 Section 210500 "Common Work Results for Fire Suppression," for materials and methods for wall and floor penetrations.
3. Division 21 Section 210515 "Basic Fire Suppression Piping Material and Methods," for general piping and fitting materials and methods.
4. Division 21 Section 210533 “Heat Tracing for Fire-Suppression Piping” for heat tracing requirements.
5. Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment” for labeling and identification of installed fire suppression equipment.
6. Division 21 Section 211100 “Fire Suppression Water Service Piping” for fire suppression piping starting 5 feet outside the building to within the building.
7. Division 21 Section 211200 "Fire Suppression Standpipes" for fire-suppression standpipes inside the building.

1.02 SYSTEM DESCRIPTION

A. Fire protection system in the location or portion of the building is a combination of Wet Pipe, Dry Pipe, and Preaction Systems.

1. Wet Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to a water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts a fusible link or destroys a frangible device. Hose connections are included if indicated.

2. Dry Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed nitrogen. Opening of sprinklers releases compressed nitrogen and permits water pressure to open a dry pipe valve. Water then flows into piping and discharges from sprinklers that are open.
3. Double-Interlock Preaction Sprinkler System: Automatic sprinklers are attached to piping containing compressed nitrogen. Actuation of a fire detection system in the same area as sprinklers and loss of nitrogen pressure releases a closed solenoid valve that opens the deluge valve permitting water to flow into the sprinkler piping; then water will discharge from sprinklers that have opened.

B. Provide system(s) as specified herein and as shown on drawings. The sprinkler system shall be supplied by the underground and fire suppression standpipe system as shown on the Drawings.

C. Provide dry pipe fire protection system for non-heated spaces and other areas of building subject to freezing including the loading docks and canopies, mansards, and balconies. Portions of systems subject to freezing or temperatures below 40° F shall be protected against freezing as required by NFPA 13. The Contractor shall be responsible for repairs and for all costs incurred from damage caused by freezing of the fire protection system.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design fire suppression system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Standard Pressure, Fire Suppression System Component: Listed for 175-psig minimum working pressure.

C. Performance Criteria

1. Protect entire building, unless noted otherwise, with a sprinkler system designed in accordance with NFPA 13 for Light Hazard requirements.
2. Protect mechanical and electrical areas/rooms with a sprinkler system designed in accordance with NFPA 13 for Ordinary Hazard Group 1 requirements.
3. Protect storage areas/rooms, unless noted otherwise, with a sprinkler system designed in accordance with NFPA 13 for Ordinary Hazard Group 2 requirement.
4. Other Occupancy Hazard Classifications.
    a) Restaurant Seating Areas: Light Hazard density with the approval of the AHJ.
    b) Building Service Areas: Ordinary Hazard Group 1.
    c) Automobile Parking Areas: Ordinary Hazard, Group 2.
    d) Electric Vehicle Charging Stations: Special Hazard I (See below)

e) Laundries: Ordinary Hazard, Group 1.
f) Libraries except Stack Areas: Light Hazard.
g) Machine Shops: Ordinary Hazard, Group 2.
h) Office and Public Areas: Light Hazard.
i) Residential Living Areas, Outside Dwelling/Living Unit: Light Hazard.
j) Restaurant Service Areas: Ordinary Hazard, Group1.

5. Design Criteria for Automatic-Sprinkler Piping Design:

a) Light Hazard Occupancy:

1) Minimum Design Density: 0.10 gpm over 1,500 sq.ft. area.
2) Maximum protection area per sprinkler: 225 sq.ft.
3) Minimum Combined Hose Stream Demand Requirement: 100 gpm for 30 minutes.

b) Ordinary Hazard Group 1 Occupancy:

1) Minimum Design Density: 0.15 gpm over 1,500 sq.ft. area.
2) Maximum area per sprinkler: 130 sq.ft..
3) Minimum Combined Hose Stream Demand: 250 gpm for 60 to 90 minutes.

c) Ordinary Hazard Group 2 Occupancy:

1) Minimum Design Density: 0.20 gpm over 1,500 sq.ft. area.
2) Maximum protection area per sprinkler: 130 sq.ft.
3) Minimum Combined Hose Stream Demand: 250 gpm for 60 to 90 minutes.

d) Special Occupancy Hazard:

e) Special Hazard I (EV Vehicle Charging):

1) Minimum Design Density: 0.30 gpm over entire area.
2) Maximum protection area per sprinkler: 100 sq.ft.
3) Minimum Combined Hose Stream Demand: 500 gpm for 60 to 90 minutes.

D. The criteria listed herein shall not preclude the use of extended coverage or special application fire sprinklers designed and installed in accordance with their listing and manufacturer's instructions.

E. The hydraulic area of operation may not be reduced as allowed by NFPA 13 for areas utilizing quick response sprinklers in unfinished shell spaces. For all other areas, the hydraulic area of operation shall not be reduced as allowed by NFPA 13 for areas utilizing quick response sprinklers unless specifically approved by the Engineer via a formally submitted RFI.

F. Sprinkler spacing shall conform to NFPA 13 and shall not exceed 256 SF per sprinkler in unfinished shell spaces.

G. The hydraulic area of operation shall be increased by 30% without revising the density for areas with sloped ceilings with a pitch exceeding 1 in 6 (16.7% slope) in accordance with NFPA 13.

H. The hydraulic area of operation shall be increased by 30% without revising the density for dry-pipe and double interlock preaction systems in accordance with NFPA 13.

1.04 SUBMITTALS

A. Submit shop drawings prepared in accordance with NFPA 13 as specified in Division 21 Section 210010 "General Fire Suppression Requirements."

1.05 QUALITY ASSURANCE

A. Contractor shall be responsible for all permits and fees associated with preparation and approval of Drawings and the installation and approval of a fire sprinkler system.

B. Tests and Inspections: Arrange, test, and pay for all tests required by code and authorities having jurisdiction.

1.06 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.07 EXTRA MATERIALS

A. Sprinkler Wrenches: Furnish to Owner, 2 sprinkler wrenches for each type of sprinkler installed.

B. Sprinklers: Furnish extra sprinklers of each style, type and finish included in the project as required by NFPA 13.

C. Sprinkler Cabinet and Wrench: Provide a finished steel cabinet(s), suitable for wall mounting, with hinged cover and space for the quantity of spare sprinklers provided plus sprinkler wrench(es).

D. Provide hydraulic calculation placard attached to each riser.

PART 2 - PRODUCTS AND MATERIALS

2.01 EQUIPMENT

A. All fire protection equipment shall be UL listed for its intended use and in conformance with the applicable NFPA documents.

2.02 PIPE AND FITTING MATERIALS

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for specifications on piping and fittings.

2.03 HANGERS

A. Shall be UL listed and shall meet requirements of NFPA 13 for type, dimension and location.

2.04 GENERAL DUTY VALVES

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for specifications on general duty valves.

2.05 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing.
2. Pressure Rating:
    a) Standard Pressure Piping Specialty Valves: 175-psig minimum.
3. Body Material: Cast- or ductile- iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Dry-Pipe Valves:

1. Standard: UL 260.
2. Design: Differential-pressure type.
3. Include UL 1486, quick-opening devices, trim sets for bypass, nitrogen supply, drain, priming level, alarm connections, ball drip valves, pressure gauges, drip cup assembly piped with check valve to main drain piping, priming chamber attachment, and fill-line attachment with strainer.
4. Air-Pressure Maintenance Device:
    a) Type: Automatic device to maintain minimum air pressure in piping.
    b) Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.
5. Nitrogen Compressor:
    a) SouthTek N2-Blast FPS 1650, or owner approved equal.
    b) Additional equipment:
        1) N2Blast AutoPurge System
        2) BlastOff III – Early Warning System

3) Quick Fill Air Compressor

a) Standard: UL's "Fire Protection Equipment Directory" listing.
b) Integral Type: Oil-less, air-cooled
c) Motor Horsepower: 2-HP.
d) 120V works most of the time but for larger air compressors, a different voltage may be required, e.g. 240-V ac.
e) Power: 120-V ac, 60 Hz, single phase, hard wired per NEC and manufacturer's requirements.
f) Provide combination fused disconnect switch and magnetic starter.

c) Optional Equipment to be owner approved:

1) BlastOff IV – Onboard Purity Alarm
2) Quick-Check – 6 Zone Purity Manifold
3) N2-Blast Preventative Maintenance Box

C. Preaction (Deluge) Valve

1. Standard: UL 260.
2. Design: Differential-diaphragm type, externally reset.
3. Include trim sets for bypass, nitrogen supply, drain, alarm connections, ball drip valves, pressure gauges, drip cup assembly piped without valves and separate from main drain line, fill-line attachment with strainer, and push-rod chamber supply connection.
4. Air Pressure Maintenance Device:

a) Type: Automatic device to maintain minimum air pressure in piping.
b) Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.

5. Nitrogen Compressor:

a) SouthTek N2-Blast FPS 1650, or owner approved equal.
b) Additional equipment:

1) N2Blast AutoPurge System
2) BlastOff III – Early Warning System
3) Quick Fill Air Compressor

a) Standard: UL's "Fire Protection Equipment Directory" listing.
b) Integral Type: Oil-less, air-cooled
c) Motor Horsepower: 2-HP.

d) 120V works most of the time but for larger air compressors, a different voltage may be required, e.g. 240-V ac.

e) Power: 120-V ac, 60 Hz, single phase, hard wired per NEC and manufacturer's requirements.

f) Provide combination fused disconnect switch and magnetic starter.

c) Optional Equipment to be owner approved:

1) BlastOff IV – Onboard Purity Alarm
2) Quick-Check – 6 Zone Purity Manifold
3) N2-Blast Preventative Maintenance Box

6. Releasing Method:

a) Electric/Electric. One 24-V dc normally closed (NC) electric solenoid and one 24-V dc pressure switch.

1) Smoke Detectors: Photoelectric type complying with UL 268 operating at 24-V dc, nominal with integral addressable module arranged to communicate detector status (normal, alarm, or trouble) to fire alarm control unit. Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Device shall have an integral visual-indicating light, LED type, indicating detector has operated and power-on status. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation. Photoelectric detectors shall have sensitivity between 0.5 and 3.5 percent/foot smoke obscuration.

7. Emergency Pull Box: metal enclosure, labeled with "Manual Emergency Station" and operating instructions, complete with union, 1/2-inch pipe nipple, and bronze ball valve. The enclosure cover shall be held closed by a breakable strut, which prevents accidental opening, and must be replaced after each opening.

8. Deluge/Preaction System Control Panel: Panels shall be single area, two area, or single area cross zoned type as indicated. Control panel shall consist of a NEMA 1 enclosure, and contains detector, alarm, and solenoid valve circuitry for operation of deluge valves. Panels shall contain power supply, battery charger, standby batteries, field wiring terminal strip, electrically supervised solenoid valves and polarized fire alarm bell, lamp test facility, SPDT auxiliary alarm contacts, and rectifier. Electrical characteristics shall be 120 volts AC, 60 Hz, with 24 volts DC gel cell batteries.

D. Air Release Valve:

1. Provide for all wet pipe sprinkler systems utilizing metallic piping in accordance with one of the following options:

    a) Manual ball valve with a minimum size of ½ inch (15 mm).
    b) Listed and/or Factory Mutual Approved automatic valve.

2.06 PIPE FITTINGS

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 175-psig minimum.
3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-T and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, welded or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" listing.
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Grooved or threaded.

C. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" listing.
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

D. Flexible Piping Systems:

1. At Contractor’s option, UL listed and FM approved flexible piping connections to sprinklers may be used for both acoustical panel and gypsum board ceilings when suitable for their intended use. Piping shall be seismically qualified per ICC-ES AC-156 where required.
2. Description: Connections shall include a leak-tested sprinkler drop with a minimum internal corrugated hose diameter of 1 inch.
3. Flexible piping lengths shall not exceed 6 feet.
4. Installation shall not exceed the minimum bend radius and maximum allowable bends as specified by the manufacturer.
5. Change in direction shall be gradual enough to allow flexible piping to bend without crimping, distorting or reducing internal diameter.

2.07 AUTOMATIC SPRINKLERS

A. Sprinklers: type and style as indicated or required by application. Sprinkler operating temperatures to comply with NFPA 13. Sprinklers in Light Hazard areas shall be quick response type.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory".
2. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with discharge coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Use sprinkler types below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed sprinklers.
3. Rooms with Gypsum Board Ceilings: Concealed sprinklers.
4. Wall Mounting: Sidewall sprinklers.
5. Spaces Subject to Freezing: Dry pendent or dry sidewall sprinklers as indicated on drawings.

E. Provide sprinkler types below with finishes indicated.

1. Finished Areas:

a) Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
b) Upright, Pendent, and Sidewall Sprinklers: Bright chrome, with bright chrome escutcheon.
c) Unfinished Areas: Rough bronze in unfinished spaces not exposed to view.

F. Coordinate sprinkler temperature ratings near heat-producing sources in accordance with NFPA 13.

G. Sprinklers shall be wax coated where exposed to acids, chemicals, or other corrosive fumes.

H. Sprinkler Guards: Provide sprinkler guard where sprinklers are less than 7-feet above finished floor; where subject to physical damage, and/or where indicated on drawings. Guard shall be UL 199 listed, wire cage type with fastening device for attaching to sprinkler.

I. Sprinkler Cabinet and Wrench: Provide a finished steel cabinet, suitable for wall mounting, with hinged cover and space for the appropriate quantity of spare sprinklers plus sprinkler wrench(es).

2.08 ALARM DEVICES

A. General: Alarm device types shall match piping and equipment connections.

B. Audible/Visual Alarm Notification Appliances (Horn/Strobe):

1. Standard: UL 1971 combination horn and strobe appliance.
2. Horn: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn.
3. Strobes: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch (25-mm) high letters on the lens.
4. Audible/visual notification appliance shall be exterior, weatherproof with weatherproof backbox.

C. Water Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory set, field-adjustable retard element to prevent false signals and tamperproof cover.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Design Installation: Horizontal or vertical.

D. Pressure Switches – Water Flow Alarm Detection:

1. Standard: UL 346.
2. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory set, field adjustable retard element to prevent false signals and tamperproof cover.
3. Type: Electrically supervised water flow switch with retard feature.
4. Pressure Rating: 250 psig.
5. Design Operation: Rising pressure signals water flow.

E. Pressure Switches – Low/High Air Pressure Supervisory:

1. Standard: UL 346.

2. Components: Two single-pole, double-throw circuit switches for isolated alarm contacts, 7 A, 125-V ac and 0.25 A, 24-V dc.
3. Type: Electrically supervised pressure supervisory switch
4. Pressure Rating: 250 psig.
5. Design Operation: Rising pressure signals excessive supervisory air pressure within the system piping, with lowering pressure signals lack of air pressure within the system piping.

F. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts and tamperproof cover.
4. Design: Signals that controlled valve is in other than fully open position.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's instructions.

3.02 PREPARATION

A. Perform fire hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

3.03 WATER SUPPLY CONNECTION

A. Connect sprinkler piping to water service piping for service entrance to building. Do not connect to underground supply until provided with written documentation that piping has been flushed and pressure tested in accordance with NFPA 13. Comply with requirements for exterior piping in Division 21 Section 211100 "Fire Suppression Water Service Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Comply with requirements for backflow preventers in Division 21 Section 211100 "Fire Suppression Water Service Piping."

C. Wet pipe systems shall be equipped with a listed relief valve not less than ½-inch in size and set to operate at 175 psi or 10 psi in excess of the maximum system pressure, whichever is greater.

3.04 PIPE APPLICATIONS

A. Piping Below Grade: Refer to Division 21 Section 211100 "Fire Suppression Water Service Piping."

B. Piping Above Grade: Refer to Division 21 Section 210515 “Basis Fire Suppression Piping Materials and Methods.”

3.05 PIPING INSTALLATIONS

A. Refer to Division 21 Section 210515“Basic Fire Suppression Piping Materials and Methods” for general fire suppression piping installation requirements.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Hangers and Supports: Comply with the requirements of NFPA 13. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake if required by the applicable building code, designed in accordance with NFPA 13. Locate hangers at or directly adjacent to the joist panel points. Provide two nuts on threaded supports to securely fasten the support.

D. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.

E. Install pressure gauge on the riser or feed main at or near each test connection. Provide pressure gauge with a connection not less than 1/4 inch and having a soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

F. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

G. Drain dry-type sprinkler system piping.

H. Pressurize and check preaction sprinkler system piping.

I. Fill wet-type sprinkler system piping with water.

J. Connect compressed nitrogen supply to dry pipe sprinkler piping.

K. Connect nitrogen compressor to the following piping and wiring:

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

L. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section 210515 "Basic Fire Suppression Piping Materials and Methods"

M. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section 210515 "Basic Fire Suppression Piping Materials and Methods."

3.06 PIPE JOINT CONSTRUCTION

A. Refer to Division 21 Section 210515 “Basic Fire Suppression Piping Materials and Methods” for general pipe joint construction requirements.

3.07 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable water supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Deluge/Preaction Valves: Install in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.
    a) Install nitrogen compressor and compressed nitrogen supply piping. Connect compressor outlet with the pipe through a shutoff valve to the system side of the deluge valve. Adjust pressure switch to the required setting.
    b) Air Pressure Maintenance Device: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.

3.08 SPRINKLER INSTALLATIONS

A. Use proper tools to prevent damage during installations.

B. Install sprinklers in suspended ceilings in center of acoustical ceiling panels, in a symmetrical pattern with lights and outlets.

C. Install sprinklers in a symmetrical pattern with lights and outlets in all other areas with ceilings.

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

E. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

F. Do not install more than one sprinkler on a one inch outlet unless hydraulic calculations are included to verify performance.

3.09 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and Division 21 Section 210553 “Identification for Fire Suppression Piping and Equipment.”

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.010 FIELD QUALITY CONTROL

A. Perform required tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, “Systems Acceptance” Chapter.
4. Energize circuits to electrical equipment and devices.
5. Start and run nitrogen compressors.
6. Coordinate with fire alarm tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

C. Replace piping system components that do not pass the test procedures specified, and retest repaired portion of the system.

3.011 CLEANING

A. Clean dirt and debris from sprinklers.

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

3.012 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.013 COMMISSIONING

A. Sprinkler Systems: Test per NFPA 13, NFPA 25 and local authorities requirements. Submit Contractor's Material & Test Certificates for Above Ground Piping. Submit certificates of completion to Authority Having Jurisdiction and Owner.

1. After completion of all installation, tests, etc., and prior to the opening date, the Sprinkler Subcontractor shall instruct the building personnel in the operation of the sprinkler system. Special care shall be taken to make sure the building personnel:

a) Will immediately recognize whether the system control valves are in an 'Open' position or a 'Closed' position.
b) Will know how to drain the system.
c) Will know how to test the flow switches, tamper switches and alarm system.
d) Will know how to test the dry pipe/preaction valve.
e) Will know how to make complete weekly inspection.
f) Will know how to perform periodic maintenance of the Fire Sprinkler System.

B. Fire Alarm Equipment: Test per NFPA 25, NFPA 72 and local authorities requirements in the presence of the Owner. Submit certificates of completion to authority having jurisdiction and Owner.

C. Preaction System: Test per NFPA 13, NFPA 25, NFPA 72 and local authorities requirements in the presence of the Owner. Submit certificates of completion to authority having jurisdiction and Owner.

END OF SECTION

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