

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 – GENERAL

1.01 SUMMARY

- A. The intent of Division 21, Fire Suppression Specifications, and the accompanying Drawings is to be a reference for preliminary locations and routing of fire protection system components. Not all components required for a complete system are shown, including but not limited to standpipes, hose connections, sprinkler heads, fire protection zones, air compressors, dry valves, piping, appurtenances, connections, etc.
- B. Provide a complete and workable facility with complete systems that comply with the requirements of the state codes, local codes, fire marshal, owner's insurance underwriter, and any other authority having jurisdiction.
- C. Division 21, Fire Suppression Specifications and the accompanying Drawings are complimentary and what is called for by one as binding as if called for by both. Items shown on the Drawings are not necessarily included in the Specifications and vice versa.
- D. Imperative language is frequently used in Division 21, Fire Suppression Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor.
- E. Piping and sprinkler head locations meet the Architectural design intent for the building in addition to applicable code. The right is reserved to make any reasonable changes in sprinkler head location prior to roughing-in, without cost impact. Deviation from the general routing piping mains, standpipes, or other routing shown must be approved by the architect prior to installation. If additional space is required for fire protection system components, Architect to make a formal request.
- F. Heat, heat trace, and associated power required for fire protection system components are the responsibility of the design-build contractor. Request approval from the electrical engineer to use spaces in electrical panels provided at no additional cost.
- G. Furnish piping, pipe fittings, valves, gauges, and incidental related items as required for complete systems. Identify valves, piping and equipment components to indicate their function and system served.
- H. The General and Supplemental Conditions apply to this Division, including but not limited to:
 - 1. Drawings and specifications.
 - 2. Public ordinances, permits.
 - 3. Include payments and fees required by governing authorities for work of this Division.
- I. Division 01, General Requirements, applies to this Division.

1.02 RELATED SECTIONS

- A. Division 01, General Requirements
- B. Division 21, Fire Suppression
- C. Section 21 10 00, Water Based Fire Suppression Systems
- D. Section 21 11 20, Fire Suppression Pumps
- E. Section 21 20 00, Gaseous Fire Extinguishing Systems
- F. Section 21 30 00, Fire Pumps

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Products and equipment prohibited from containing pentabrominated, octabrominated and decabrominated diphenyl ethers. Where products or equipment's within this specification contain these banned substances, provide complying products and equipment's from approved manufacturers with equal performance characteristics.
 - 2. General:
 - a. Conform Work and materials to requirements of the local and State codes, fire marshal, the owner's insurance underwriter, and any other authority having jurisdiction; and Federal, State and other applicable laws and regulations.
 - 3. Contractor responsible for obtaining and payment for permits, licenses, and inspection certificates required in accordance with provisions of Contract Documents.
 - 4. Fire protection system designs must bear the stamp and seal of the registered Professional Engineer who prepared the documents. The Engineer's stamp certifies that the work was done under the Engineer's supervision and control. Certification from NICET technicians, or other contractors, cannot replace the certification by the Engineer. Verify/coordinate with local building department for their specific requirements.
- B. New materials and Equipment:
 - 1. Good work quality, free of faults and defects and in conformance with the Contract Documents.
- C. Apparatus: Build and install to deliver full rated capacity at the efficiency for which it was designed.
- D. The entire system and apparatus operate at full capacity without objectionable noise or vibration.
- E. For remodel projects, the existing system must remain fully operational, or provisions made to provide coverage while the new system is being installed. New installation switchover requires minimal down time. Provide method to maintain fire protection or fire watch during any system down time. Include any related cost for materials or labor that is needed for providing continuous coverage.
- F. Install equipment level and true equipment. Housekeeping pads and curbs account for floor or roof slope.
- G. Materials and Equipment:
 - 1. Each piece of equipment furnished meet detailed requirements of the Drawings and Specifications and suitable for the installation shown. Equipment not meeting requirements will not be acceptable, even though specified by name along with other manufacturers.
 - 2. Where two or more units of the same class of equipment are furnished, use products of the same manufacturer. Component parts of the entire system need not be products of same manufacturer.
 - 3. Furnish materials and equipment of size, make, type, and quality herein specified.

4. Equipment scheduled by performance or model number considered the basis of the design. If other specified manufacturer's equipment is provided in lieu of the basis of design equipment the contractor is responsible for changes and costs which may be necessary to accommodate this equipment, including different sizes and locations for connections, different electrical characteristics, different dimensions, different access requirements, or any other differences which impact the project.
- H. Workmanship:
1. General: Install materials in a neat and professional manner.
 2. Manufacturer's Instructions:
 - a. Follow manufacturer's directions where they cover points not specifically indicated. If they are in conflict with the Drawings and Division 21, Fire Suppression Specifications, obtain clarification before starting work.
- I. Cutting and Patching:
1. Cutting, patching, and repairing for the proper installation and completion of the work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting performed by skilled craftsmen of each respective trade in conformance with the appropriate Division of Work.
 2. Make additional openings required in building construction by drilling or cutting. Use of jackhammer is specifically prohibited.
 3. Fill holes which are cut oversize so that a tight fit is obtained around the sleeves passing through.
 4. Do not pierce beams or columns without permission of Architect and then only as directed.
 5. New or existing work cut or damaged restored to its original condition. Where alterations disturb lawns, paving, walks, etc., the surfaces repaired, refinished, and left in condition existing prior to commencement of work.

1.04 SUBMITTALS

- A. Certified Shop Drawings:
1. Drawings indicate the general layout of the piping and various items of equipment. Coordination with other trades and with field conditions will be required. For this purpose, prepare fire protection system layout Drawings showing locations and types of head or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items. New drawings prepared by Contractor and not reproductions or tracings of Architect's Drawings. Overlay drawings with shop drawings of other trades and check for conflicts. Drawings the same size as Architect's Drawings with title block similar to the Drawings and identifying Architect's Drawing number or any reference drawings. Drawings fully dimensioned including both plan and elevation dimensions. Shop drawings cannot be used to make scope changes.
 2. Shop Drawings:
 - a. Prepare in two-dimensional format.
 - b. Include but are not limited to:
 - 1) Sprinkler head layout drawings overlaid with ceiling and floor plans.
 - 2) Sprinkler floor plans, including piping, equipment, and heads to a minimum of 1/4-inch equals 1-foot scale or same as plans, whichever is greater.

SECTION 21 05 00
COMMON WORK RESULTS FOR FIRE SUPPRESSION

- 3) Superplot plans of above ground work with a colored overlay of all trades including, but not limited to, HVAC piping, HVAC equipment, plumbing piping and equipment, sprinklers, lighting, lighting controls, cable tray, fire alarm devices, electrical power conduit, and ceiling system to a minimum of 1/2-inch equals 1-foot scale.
 - 4) Beam penetration drawings indicating beam penetrations meeting the requirements indicated on the floor plans and on the structural drawings to a minimum of 1/4-inch equals 1-foot scale.
 - 5) Slab penetration drawings of HVAC, plumbing, sprinklers, lighting and electrical to a minimum of 1/4-inch equals 1-foot scale.
 - 6) Fabrication drawings of radiant ceiling panels, architectural metal ceiling, including panel penetrations for lighting, sprinkler heads, fire alarm devices, and any other penetrations.
3. Submit shop drawings for review prior to beginning fabrication. Additional shop drawings may be requested when it appears that coordination issues are not being resolved in the field or when there is a question as to whether contract documents are being complied with or the design intent is being met.
- B. Product Data:
1. Submit product data for review on scheduled pieces of equipment, on equipment requiring electrical connections or connections by other trades, and as required by each specification section or by Drawing notes. Include manufacturer's detailed shop drawings, specifications, and data sheets. Data sheets include capacities, RPM, BHP, pressure drop, design and operating pressures, temperatures, and similar data. Manufacturer's abbreviations or codes are not acceptable
 2. Provide sample of each type of sprinkler head.
 3. Indicate equipment operating weights including bases and weight distribution at support points.
 4. In the case of equipment such as wiring devices, time switches, valves, etc., specified by specific catalog number, a statement of conformance will suffice.
- C. Hydraulic Calculations:
1. Submit hydraulic calculations specific to the installation.
- D. Test Reports:
1. Submit certificates of completion of tests and inspections.
- E. Submission Requirements:
1. Refer to Division 01, General Requirements for additional requirements related to submittals.
 2. Shop Drawings:
 - a. Provide three sets of Drawings showing sprinkler head locations and layout coordinated with architectural ceiling details to the Architect for review prior to submitting Drawings to insurance underwriter and Fire Marshal.
 - b. Provide six sets of Drawings and calculations to the Architect to be sent to the Owner's insurance underwriter for approval.
 - c. Then submit six sets of approved Drawings to Architect for final review.

3. Product Data:
 - a. Submit electronic copies of shop drawings and product data for Work of Division 21 in PDF format with each item filed under a folder and labeled with its respective specification section number, article, paragraph, and mark, if applicable.
 - b. Include a complete index in the original submittal. Indicate both original items submitted and note stragglers that will be submitted at a later date to avoid delay in submitting.
 - c. Submit shop product data in a single submittal. Partial submittals will not be accepted. Re-submittals submitted after return of the original binder includes a tab similar to that originally submitted. Upon receipt of the returned re-submittals, insert them in the previously submitted binder.
- F. Contractor Responsibilities:
 1. See that submittals are submitted at one time and are in proper order.
 2. Obtain approvals and permits from the AHJ.
 3. Ensure that equipment will fit in the space provided.
 4. Assure that deviations from Drawings and Specifications are specifically noted in the submittals. Failure to comply will void review automatically.

1.05 OPERATING AND MAINTENANCE MANUAL, PARTS LISTS, AND OWNERS INSTRUCTIONS

- A. Refer to Division 01, General Requirements for additional requirements.
- B. Submit three bound copies of manufacturer's operation and maintenance instruction manuals and parts lists for each piece of equipment or item requiring servicing. Literature on 8-1/2-inch by 11-inch sheets or catalogs suitable for side binding. Submit data when the work is substantially complete, packaged separately, and clearly identified in durable 3-ring binder. Include name and contact information for location of source parts and service for each piece of equipment. Clearly mark and label in each submittal, the piece of equipment provided with the proper nameplate and model number identified. Provide wiring diagrams for electrically powered equipment.
- C. Instruct Owner thoroughly in proper operation of equipment and systems, in accordance with manufacturer's instruction manuals. Operating instructions cover phases of control.
- D. Furnish competent engineer knowledgeable in this building system for minimum of one 8-hour day to instruct Owner in operation and maintenance of systems and equipment. Keep a log of this instruction including dates, times, subjects, and those present and present such log when requested by Architect.
- E. Provide fire pump as-constructed data, and installation, start-up and testing manuals.

1.06 AS-BUILT DRAWINGS

- A. Provide 3D model and record drawings at the end of the project on CD-ROM.
- B. 3D model in the following format:
 1. AutoCAD
 2. Revit
 3. Navisworks
- C. Provide record drawings in hard copy and PDF format.
 1. Drawings include the following:
 - a. Project specific title block.
 - b. Notations reflecting the as built conditions of any additions to or variations from the construction documents provided as part of the BIM coordination, RFIs, ASIs, Owner Changes, and Field Coordination.

1.07 PROJECT CONDITIONS

- A. Existing Conditions: Prior to bidding, verify and become familiar with existing conditions by visiting the site, and include factors which may affect the execution of this Work. Include related costs in the initial bid proposal.
- B. Coordinate exact requirements governed by actual job conditions. Check information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.
- C. Coordinate shutdown and start-up of existing, temporary, and new systems and utilities. Notify Owner, City, and Utility Company.

1.08 WARRANTY

- A. Provide a written guaranty covering the work of this Division (for a period of one calendar year from the date of acceptance by the Owner) as required by the General Conditions.
- B. Provide manufacturer's written warranties for material and equipment furnished under this Division insuring parts and labor for a period of one year from the date of Owner acceptance of Work of this Division.
- C. Correct warranty items promptly upon notification.

1.09 PROVISIONS FOR LARGE EQUIPMENT

- A. Make provisions for the necessary openings in building to allow for admittance of equipment.

1.10 TEST REPORTS AND CERTIFICATES

- A. Submit one copy of test reports and certificates specified herein to the Architect.

1.11 SUBSTITUTIONS

- A. Submit any requests for product substitutions in accordance with the Instructions to Bidders and the General and Supplemental Conditions.

PART 2 – PRODUCTS

2.01 ACCESS PANELS

- A. Furnish under this Division as specified in another Division of work.

2.02 PIPE SLEEVES

- A. Interior Wall and Floor Sleeves:
 - 1. 18 gauge galvanized steel or another pre-approved water tight system.
- B. Interior Wall and Floor Sleeves (fire rated):
 - 1. Fire rated and water tight system approved by Authority Having Jurisdiction and Owners Insurance underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves:
 - 1. Cast Iron
- D. On Grade Floor Sleeves:
 - 1. Same as exterior wall sleeves.

2.03 FLOOR, WALL AND CEILING PLATES

- A. Furnish stamped split type plates as follows:
 - 1. Floor Plates:
 - a. Cast brass, chromium plated.
 - 2. Wall and Ceiling Plates:
 - a. Spun aluminum.

2.04 MACHINERY GUARDS

- A. Furnish guards for protection on rotating and moving parts of equipment. Provide guards for drives and motor pulleys, regardless of being enclosed in a metal cabinet.
- B. Design guards so as not to restrict air flow or heat transfer.
- C. Provide shaft holes in guards for easy use of tachometers at pulley centers. Guards easily removable for pulley adjustment or removal and changing of belts.
- D. Meet OSHA requirements including back plates.

2.05 ELECTRICAL EQUIPMENT

- A. General:
 - 1. Equipment and installed work as specified under Division 26, Electrical.
- B. Motors:
 - 1. Furnish as integral part of driven equipment. Drip-proof induction type with ball bearings unless noted otherwise.
 - 2. Built to NEMA Standards for the service intended.
 - 3. Rated for the voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
 - 4. Manufacturers:
 - a. Baldor
 - b. Westinghouse
 - c. General Electric
 - d. Or approved equal.
 - 5. Where provided, refer to Equipment Schedules on the Drawings for motor horsepower, voltage, and phase.
 - 6. Refer to individual product sections for additional motor requirements.
 - 7. Built-in thermal overload protection, or be protected externally with separate thermal overload devices with low voltage release or lockout. Hermetically sealed motors have quick trip devices.
- C. Starters:
 - 1. Provided under Division 26, Electrical, suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.
- D. Equipment Wiring:
 - 1. Provide interconnecting wiring within or on a piece of fire suppression equipment with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers provided under Division 26, Electrical.
- E. Control Wiring:
 - 1. Provide control wiring for fire suppression equipment.
- F. Codes:
 - 1. Electrical equipment and products to bear the UL as required by governing codes and ordinances.

PART 3 – EXECUTION

3.01 COORDINATION

- A. Coordinate fire protection piping and appurtenances with ducts, other piping, electrical conduit, and other equipment.
- B. Conceal fire protection piping and equipment be concealed except in area without ceilings and as noted on the Drawings.
- C. Locate piping, heads, and equipment where shown on Drawings.

3.02 GENERAL

- A. Install fire protection systems to serve the entire building.
- B. The drawings indicate approximate locations of piping, sprinkler zones, and types of systems. The drawings do not indicate the locations of sprinkler heads in ceiling areas. Locate sprinklers in the center of ceiling panels and symmetrically within rooms and down corridors, coordinated with and in pattern with lights and grilles. Deviations must be approved.
- C. Locations of sprinkler heads, outlets, piping, and appurtenances are not shown in areas and therefore are to be installed in accord with code requirements.
- D. Location of heads shown in ceiling areas may be changed if required by code requirements, but only after review by the Architect for new head locations for each specific instance.

3.03 SLEEVES

- A. Interior Floor and Wall Sleeves:
 - 1. Provide sleeves large enough to provide clearances around pipe outside diameter as required by NFPA. Penetrations through mechanical room and fan room floors made watertight by packing with safing insulation and sealing with Tremco Dymeric Sealant or approved water tight system.
- B. Sleeves through Rated Floors and Walls:
 - 1. Similar to interior sleeves except install fire-rated system approved by Authority Having Jurisdiction and Owner's Insurance Underwriter, with rating equal to floor or wall penetration, and designed specifically for the floor or wall construction, piping material, size and service.
- C. Exterior Wall Sleeves Below Grade:
 - 1. Large enough to allow for caulking and made watertight. Caulking from outside using link-seal modular wall and casing seal or lead and oakum. Secure sleeves against displacement.
- D. On Grade Floor Sleeves:
 - 1. Same as below grade exterior wall sleeves, caulked from inside.
- E. Exterior Wall Sleeves Above Grade:
 - 1. Similar to interior wall sleeves except caulk outside with Tremco Dymeric Sealant.
- F. Layout work prior to concrete forming. Do cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
- G. Floor sleeves maintain a water barrier by providing a water tight seal or extend 1-inch above finished floor except through mechanical equipment room floors and shafts where sleeves extend 2-inches above finished floor level. Sleeves through roof extend 8-inches above roof. Wall sleeves flush with face of wall unless otherwise indicated. Sleeves through planters extend 8-inches above planter base.
- H. Do not support pipes by resting pipe clamps on floor sleeves. Provide supplementary members so pipes are floor supported.

- I. Special sleeves detailed on the Drawings take precedence over this section.

3.04 FLOOR, WALL AND CEILING PLATES

- A. Install on piping passing through finished walls, floors, ceilings, partitions, and plaster furrings. Plates completely cover opening around pipe and duct.
- B. Secure wall and ceiling plates to pipe or structure.
- C. Plates not required in mechanical rooms or unfinished spaces.

3.05 CLEANING

- A. General:
 - 1. Clean equipment and piping of stampings and markings (except those required by codes), iron cuttings, and other refuse.
- B. Painted Surfaces:
 - 1. Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.
- C. Additional requirements are specified under specific Sections of this Division.

3.06 EQUIPMENT PROTECTION

- A. Keep pipe and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, equipment, and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore damaged or contaminated equipment, or apparatus to original conditions or replace at no cost to the Owner.
- B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.
- C. Cover or otherwise suitably protect equipment and materials stored on the job site.

3.07 ACCESSIBILITY

- A. General:
 - 1. Locate valves, indicating equipment or specialties requiring frequent reading, adjustments, inspection, repairs, and removal or replacement conveniently and accessibly with reference to the finished building.
- B. Gauges:
 - 1. Install gauges so as to be easily read from the floors, platforms, and walkways.

3.08 PAINTING

- A. General:
 - 1. Coordinate painting of fire suppression equipment and items with products and methods in conformance with the appropriate Division of Work, Painting.
- B. Equipment Rooms and Finished Areas:
 - 1. Hangers
 - 2. Miscellaneous Iron Work
 - 3. Structural Steel Stands
 - 4. Tanks
 - 5. Equipment Bases:
 - a. Paint one coat of black enamel.
 - 6. Steel Valve Bodies and Bonnets:
 - a. One coat of black enamel.

- 7. Equipment:
 - a. One coat of red machinery enamel. Do not paint nameplates.
- 8. Sprinkler Heads:
 - a. Not painted.
- C. Concealed Spaces (above ceilings, not visible):
 - 1. Hangers, Miscellaneous Iron Work, Valve Bodies, and Bonnets: Not painted.
- D. Sprinkler Piping:
 - 1. Concealed from View: Not painted.
 - 2. Exposed to View: Paint pipe and hangers exposed to view, including in equipment spaces, with one coat approved rust inhibiting primer. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
 - 3. Exterior: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel. Final finish coat as specified in conformance with the appropriate Division of Work, Painting.
 - 4. Alarm Bell: Factory paint with two coats of red enamel.

3.09 ADJUSTING AND CLEANING

- A. General:
 - 1. Before operating any equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made accordingly and that recommended lubricants have been used.
 - 2. Use particular care in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment as approved or replace with new equipment.
- B. Piping:
 - 1. Clean interior of piping before installation.
 - 2. Flush sediment out of piping systems.

3.10 ELECTRICAL EQUIPMENT

- A. Do not install fire suppression systems in switchgear rooms, transformer vaults, telephone rooms, or electric closets except as indicated.
- B. Fire Suppression systems not to pass over switchboards or electrical panelboards. Where conflicts exist, bring to attention of Architect.

END OF SECTION

SECTION 21 10 00

WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes Design-Build work and the following:
 - 1. Sprinkler Heads
 - 2. Black Steel Pipe
 - 3. Mechanical Pipe Couplings and Fittings
 - 4. Piping Markers

1.02 RELATED SECTIONS

- 1. Division 01, General Requirements
- 2. Division 21, Fire Suppression
- 3. Section 21 20 00, Gaseous Fire Extinguishing Systems

1.03 QUALITY ASSURANCE

- A. Provide a complete automatic fire sprinkler/combination standpipe system.
 - 1. Castings used for coupling housings, fittings, valve bodies, etc., date stamped for quality assurance and traceability.
- B. Regulatory Requirements:
 - 1. Sprinkler system to comply with NFPA 13 and local Fire Marshal requirements.
 - 2. Refer to Section 21 05 00, Common Work Results for Fire Suppression for additional requirements.
- C. Hydraulically Calculated Sprinkler System: Sprinkler system to be hydraulically calculated grid system designed to provide:
 - 1. Light Hazard Occupancies: 0.10 GPM/Ft² density at most remote 1500 SF for public areas, living spaces, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements.
 - 2. Ordinary Hazard Occupancies Group 1: 0.15 GPM/Ft² density at most remote 1500 SF for mechanical rooms, kitchen, and parking areas, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements.
 - 3. Ordinary Hazard Occupancies Group 2: 0.20 GPM/Ft² density at most remote 1500 SF for mechanical rooms, kitchen, and parking areas, or designated by the local fire marshal with an excess of 10 psi additional pressure requirements incorporated into the design over specified pressure requirements.
- D. NFPA 13 (without the use of exceptions found in NFPA 13 systems minimum guideline) used for the location, sizing, and installation of piping and sprinkler systems unless local fire marshal or owner's insurance underwriter requirements are more stringent. Exceptions must be approved by the Engineer prior to usage.
- E. Water Service Pressure Basis of Design:
 - 1. Coordination was done to determine fire service water pressure used to develop the fire sprinkler system design information included herein.
 - 2. Fire Protection contractor to obtain current flow test information prior to starting their design of the fire sprinkler system.

- F. Automatic sprinklers within elevator hoistways and machine rooms complies with ANSI A17.1-102.2 (c) 4 requirements.

1.04 SUBMITTALS

- A. Provide submittal in accordance with Section 21 05 00, Common Work Results for Fire Suppression.
- B. Sprinklers referred to on shop drawings and identified by the listed manufacturer's style or series designation. Trade names and abbreviations are not permitted.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Sprinkler Heads:
 - 1. Viking
 - 2. Victaulic
 - 3. Reliable Automatic Sprinkler
 - 4. Tyco Fire Products
- B. Piping Markers:
 - 1. W.H. Brady
 - 2. Seton
 - 3. Marking Systems, Inc. (MSI).

2.02 SPRINKLER HEADS

- A. General:
 - 1. One manufacturer throughout building. Mixing of sprinkler brands is not permitted.
 - 2. Brass frame construction with a coated metal-to-metal seating mechanism. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited.
 - 3. Quick response frangible bulb type fusible element with a temperature rating of 155 degrees or 200 degrees F or a fast response metal type fusible element with a temperature rating of 165 degrees or 212 degrees F.
 - 4. 1/2-inch NPT, a standard orifice, and a 5.6 nominal K Factor.
 - 5. UL listed and FM Approved for working water pressures up to 175 psi. Sprinkler heads in dry and pre-action type systems installed per NFPA 13.
 - 6. Heads, UL approved for application and installation.
- B. Provide high temperature, 212 degrees F heads for mechanical rooms, areas below skylights, dishwashing and other areas which have high heat producing equipment to prevent accidental trip page.
- C. Sprinklers Installed in Finished Ceilings:
 - 1. Quick response, recessed, bulb type, white finish, 165 degrees F unless required otherwise.
- D. Sprinklers Installed in Unfinished Ceiling Areas (or Above Finished Ceilings Where Required):
 - 1. Pendant or up-right fusible solder type, rough bronze finish, and adequate temperature for the hazard.
- E. Flexible Stainless Steel Hose:
 - 1. UL rated, FM approved stainless steel hose assembly for individual sprinkler connections, Victaulic Vic-Flex.

2. Drop includes a UL approved braided hose with a bend radius to 2-inch to allow for proper installation in confined spaces.
3. Provide union joints for ease of installation.
4. Attach flexible drop to the ceiling grid using a one-piece open gate bracket. The bracket allows installation before the ceiling tile is in place.
5. The braided drop system is UL listed and FM Approved for sprinkler services to 175 psi (1206 kPa).

2.03 BLACK STEEL PIPE

- A. General:
1. UL listed and FM approved for fire protection use.
 2. Fittings and joints must be UL listed with pipe chosen for use.
 3. Listing restrictions and installation procedures per NFPA 13 and state and local authorities for fire protection use.
 4. Pipe/fittings must be hot-dipped galvanized in accordance with ASTM A53 for dry pipe sprinkler systems.
- B. Pipe: ASTM A135 or A53.
1. Fire Protection:
 - a. Schedule 10 or Schedule 40 in sizes up to 5 inches.
 - b. 0.134-inch wall thickness for 6-inch.
 - c. 0.188-inch wall thickness for 8-inch and 10-inch.
 - d. 0.330-inch wall thickness for 12-inch.
- C. Fittings: Roll grooved ends with mechanical couplings as specified.
- D. Service Above Grade: Fire protection system only for sizes listed, as approved by NFPA 13.

2.04 MECHANICAL PIPE COUPLINGS AND FITTINGS

- A. Couplings and Fittings:
1. Coupling housing to be zero flex rigid type coupling with angled bolt pad design. Couplings fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Similar to Victaulic Type 009N.
 2. Flexible couplings to be used only when expansion contraction, deflection or noise and vibration is to be dampened. Flexible Coupling to be similar to Victaulic Installation-Ready Type 005. Coupling gasket similar to Victaulic's Grade E molded synthetic rubber per ASTM D-2000.
 3. Coupling bolts oval neck track head type with hexagonal heavy nuts per ASTM A-449 and A-183.

2.05 PIPING MARKERS

- A. Label pipes with all-vinyl, self-sticking labels or letters.
- B. Pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4 to 2-inch outside diameter, 3/4-inch letters; above 2-inches outside diameter, 2-inch letters.
- C. Identify and color code as follows with white directional arrows.

SERVICE	PIPE MARKER	BACKGROUND COLOR
SPRINKLER WATER	FIRE PROTECTION WATER	RED
AIR, COMPRESSED	*COMPRESSED AIR*	GREEN

PART 3 – EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Provide seismic hangers as required by code.
 - 2. Provide tamper switches on sprinkler system isolation valves. Provide flow switches for sprinkler zones. See Drawings for locations.
 - 3. A corrosion-resistant metal placard provided on riser indicating location number of sprinklers, design criteria, water demand, and date of installation.
 - 4. Install fire sprinklers in exhaust ductwork from grease hood per NFPA 13. Provide access doors for sprinkler access per NFPA 96 and IBC. Provide access doors at a maximum of 10-feet on center in horizontal run. Provide a dry pendant sprinkler head at top of ductwork to prevent freezing.
 - 5. Provide sprinkler systems in lab ductwork as required by code.
 - 6. Provide fire sprinkler guards on exposed sprinklers in areas subject to damage.
 - 7. Quick response sprinklers listed for installation in an Ordinary Hazard occupancy when installed in an Ordinary Hazard occupancy.
- B. Flexible Sprinkler Wet Head Drop:
 - 1. Install per manufacturer's installation requirements.
 - 2. Coordinate head location with other trades to assure space is available to maintain proper radius requirements.
 - 3. Provide flexible sprinkler drops of appropriate length as conditions require.
 - 4. Provide flexible sprinkler drops at sprinkler heads located in suspended, dropped, or acoustical ceilings. In hard lid ceiling areas, provide flexible heads at Contractor's option.
- C. Sprinklers above finished ceilings: Include heads above finished ceilings if structure is combustible, or if steel beams are not provided with spray-on fire proofing.
- D. Electrical: Electrical work to comply with Division 26, Electrical.
- E. Hangers and Supports:
 - 1. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
 - 2. Install standpipe piping, hangers, and supports in accordance with NFPA 14.
 - 3. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.
- F. Piping:
 - 1. Hold piping as tight to structure as possible. In general, run piping in areas without ceilings parallel to building elements in a neat, professional manner.
 - 2. Pipe inspector test connections to exterior and discharge as approved by local applicable governing authorities.
 - 3. Provide test tees as required.
 - 4. Install unions in non-flanged piping connections to apparatus and adjacent to screwed control valves, and appurtenances requiring removal for servicing so located that piping may be disconnected without disturbing the general system.
 - 5. Mechanical Couplings:
 - a. On systems using galvanized pipe and fittings, galvanize fittings at factory.

- b. Before assembly of couplings, lightly coat pipe ends and outside of gaskets with approved lubricant.
 - c. Pipe grooving in accordance with manufacturer's specifications contained in latest published literature.
 - 6. Install piping as to drain per NFPA 13.
 - 7. Support piping independently at apparatus so that its weight not carried by the equipment.
 - 8. Utility Marking:
 - a. Installed over the entire length of the underground piping utilities. Install plastic tape along both sides and the center line of the trenches at the elevation of approximately 12-inches above the top of utility.
- G. Piping Joints:
- 1. Join pipe and fittings using methods and materials recommended by manufacturer in conformance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc. done with proper tools and equipment. Hacksaw pipe cutting prohibited. Peening of welds to stop leaks not permitted.
 - 2. Grooved Joints:
 - a. Install in accordance with the manufacturer's latest published installation instructions.
 - b. Clean pipe ends free from indentations, projections and roll marks in the area from pipe end to (and including) groove.
 - c. Gasket manufactured by the coupling manufacturer and verified as suitable for the intended service.
 - d. Factory trained representative (direct employee) of the coupling manufacturer to provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation.
 - e. Periodically visit the job site and review installation to ensure best practices in grooved joint installation are being followed.
 - f. Remove and replace any improperly installed products.
 - 3. No couplings installed in floor or wall sleeves.
 - 4. Steel Piping:
 - a. Screwed Joints:
 - 1) Pipes cut evenly with pipe cutter reamed to full inside diameter with burrs and cuttings removed.
 - 2) Joints made up with suitable lubricant or Teflon tape applied to male threads only, leaving two threads bare.
 - 3) Joints tightened so that not more than two threads are left showing.
 - 4) Junctions between galvanized steel waste pipe and bell of cast iron pipe made with tapped spigot or half coupling on steel pipe to form spigot end and caulked.
 - b. Flanged Joints:
 - 1) Pressure rating of flanges match valve or fitting joined.
 - 2) Coat joint gaskets with graphite and oil.
 - 5. Welded Joints:
 - a. Preparation for Welding: Bevel piping on both ends before welding:

- 1) Use following weld spacing on butt welds:

NOMINAL PIPE WALL THICKNESS	SPACING	BEVEL
1/4-inch or less	1/8-inch	37-1/2
Over 1/4-inch, less than 3/4-inch	3/16-inch	27-1/2

- 2) Before welding, remove corrosion products and foreign material from surfaces.

b. Welded Joints:

- 1) Use arc-welding process using certified welders. Port openings of fittings must match the inside diameter of the pipe to which they are welded. Use full radius welding elbows for turns, use welding tees for tees. Use reducing fittings for size reduction. Weldolets may be used for branches up through one-half the pipe size of the main to which they are attached. Nipples are not allowed.

c. Welding Operation:

- 1) After deposition, clean each layer of weld metal to remove slag and scale by wire brushing or grinding. Chip where necessary to prepare for proper deposition of next layer.
- 2) Weld reinforcement no less than 1/16-inch not more than 1/8-inch above normal surface of jointed sections. Reinforcement crowned at center and taper on each side to surfaces being joined. Exposed surface of weld present professional appearance and be free of depressions below surface of jointed members.
- 3) Do not weld when temperature of base metal is lower than 0 degrees F. Material to be welded during freezing temperatures made warm and dry before welding is started. Metal warm to the hand or approximately 60 degrees F.

6. Ductile Iron Pipe: Install joints per manufacturer's written instructions.

3.02 IDENTIFICATION

A. Piping Markers:

1. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, painting, or other similar work, as follows:
- a. Every 20-feet along continuous exposed lines.
 - b. Every 10-feet along continuous concealed lines.
 - c. Adjacent to each valve and stub out for future.
 - d. Where pipe passes through a wall, into and out of concealed spaces.
 - e. On each riser.
 - f. On each leg of a T.
 - g. Locate conspicuously where visible.
2. Apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow. Arrows to be the same color and sizes as identification labels.

3.03 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform tests and arrange for required inspections of installed system as required.
 - 2. Notify the Architect 48 hours prior to any test or inspection.
 - 3. Provide final test and certification in the presence of an Owner representative. Coordinate hereunder.
- B. Inspection Service:
 - 1. At start of warranty year, execute inspection agreement.
 - 2. Without additional charge to Owner, make quarterly inspection of system during year.
 - a. Check and operate control valves.
 - b. Lubricate valve parts.
- C. Report each inspection to Owner.

END OF SECTION