

WET PIPE SPRINKLER SYSTEMS - SECTION 211313

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The following sections apply to the work of this section:
 - 1. 078413 Penetration Firestopping
 - 2. 211000 Fire Protection General Requirements
 - 3. 211100 Exterior Water Supply Main
 - 4. 213110 Fire Pump Systems
 - 5. 283111 Fire Detection and Alarm Systems

1.02 SUMMARY

- A. Scope: Provide a complete wet-pipe sprinkler system, and associated equipment, ready for operation.
- B. The work includes designing and [modifying][installing] an automatic wet pipe fire extinguishing sprinkler system for [Light Hazard] [Ordinary Hazard Group [I] [II]] [Extra Hazard - Group [I] [II]] and uniform distribution of water by hydraulic design to afford complete fire protection coverage throughout the contract area. System shall comply with FM Data Sheet 3-26.
- C. Existing Sprinkler Equipment: Existing sprinkler equipment shall be maintained fully operational until the new equipment has been tested and accepted by Lehigh University fire protection engineer. [After acceptance of the new equipment, all existing equipment so indicated shall be removed.]
- D. Authority Having Jurisdiction: Any reference in the specifications or applicable codes to the "authority having jurisdiction" shall be interpreted to mean the Lehigh University Fire Protection Engineer.

1.03 ALLOWANCES

[List Allowances, if included as part of the contract. Confirm with Lehigh University]

1.04 UNIT PRICES

[List Unit Prices, if included as part of the contract. Confirm with Lehigh University]

1.05 DEFINITIONS

- A. FM: FM Global (Factory Mutual)
- B. FPE: Fire Protection Engineer
- C. Furnish: To supply the stated equipment or materials

- D. Install: To set in position and connect or adjust for use
- E. NFPA: National Fire Protection Association
- F. NICET: National Institute for Certification in Engineering Technologies
- G. Provide: To furnish and install the stated equipment or materials
- H. UL: Underwriters Laboratories

1.06 SYSTEM DESCRIPTION:

- A. The design shall conform to NFPA 13 and the requirements specified herein. Design of the automatic wet pipe sprinkler system shall be for [Light Hazard] [Ordinary Hazard Group [I] [II]] [Extra Hazard - Group [I] [II]] occupancy by hydraulic calculation. The design, equipment, materials, installation, workmanship, examination, inspection and testing shall be in strict accordance with NFPA 13 and FM Global, except as modified herein. System design shall meet the requirements of FM Data Sheet 3-26 based on Hazard Class.
- B. All installed equipment and systems shall comply with the approvals requirements of FM Global and shall be in accordance with applicable FM Data Sheet.
- C. The system shall include all materials, accessories, and equipment inside and outside the building to provide a system complete and ready for use. Refer to Section 211100 for Installation of Exterior Water Supply Main for Fire Protection Service.
- D. Design and provide each system giving full consideration to blind spaces, piping, electrical equipment, duct work and other construction and equipment in accordance with detailed drawings to be submitted for approval.
- E. Equipment for fire protection service shall be UL listed and FM approved for use in wet pipe sprinkler systems.
- F. In the NFPA publications referred to herein, the advisory provisions shall be considered mandatory, as though the word "shall" had been substituted for "should," wherever it appears.

1.07 PERFORMANCE REQUIREMENTS

- A. Water Distribution: Distribution shall be uniform throughout the area which it is assumed the sprinkler heads will open. Variation in discharge from individual heads in the hydraulically most remote area shall be between 100 and 120 percent of the specified density.
- B. Piping Restrictions: Piping is prohibited in the following areas, except when solely supplying sprinklers in such areas:
 - 1. Electrical rooms and electrical closets.
 - 2. Telephone rooms and telephone closets.
 - 3. Elevator machine rooms and elevator shafts.
 - 4. Computer rooms.
- C. Clearance From Electrical Equipment: Piping and automatic sprinklers are prohibited directly over:

1. Transformers.
 2. Substations.
 3. Switchboards.
 4. Motor control centers.
 5. Emergency generators.
 6. Bus Ducts.
 7. Electrical panels.
- D. If installing pipe over electrical equipment is unavoidable, provide drip pans under piping to protect electrical equipment.
- E. In seismic design category C, D, E & F, sprinkler systems shall be designed for earthquake protection in accordance with the requirements and recommendations of NFPA 13.
- F. Location of Sprinkler Heads: Heads in relation to the ceiling and the spacing of sprinkler heads shall not exceed their listed area of coverage for [Light] [Ordinary] [Extra] Hazard. Uniformly space sprinklers on the branch piping. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and supply air diffusers.
- G. Sprinkler Discharge Area: The sprinkler discharge area shall be the hydraulically most remote areas as defined in NFPA 13 and FM Data Sheet 3-26. Remote area reductions permitted per NFPA 13 shall not apply. Area reductions from the FM requirements must be approved in advance by the University.
- H. Hose Allowances: System design shall include an allowance of 100 gpm for inside hose stream, and 250 gpm for total combined inside and outside hose streams.
- I. Hydraulic Calculations: Hydraulic calculations shall be in conformance with NFPA 13 and the following requirements:
1. Water Supply: [Base hydraulic calculations on a static pressure of ____ psi with ____ gpm available at a residual pressure of ____ psi at _____.] [The Contractor shall determine the characteristics of the water supply and if necessary, conduct appropriate flow tests at their expense.][Provide a copy of the most recent waterflow test with the hydraulic calculations. Water supply test may be no more than 10 months old when used for hydraulic calculations.]
 2. Margin of Safety: The sprinkler system shall be hydraulically designed so that the total waterflow and pressure demand is at least 10% less than the available water flow and pressure at the site.
 3. Friction Losses: Calculate losses in piping in accordance with the Hazen-Williams formula with "C" value of 100 for unlined ductile iron piping, 120 for steel piping, 140 for cement-lined ductile-iron piping, 150 for copper tubing and plastic piping.
 4. Flow Velocity: Piping shall be sized so that the water flow velocity does not exceed 40 ft/sec at any point in the system during maximum water flow (including inside hose demand). Flow velocity in each pipe segment is to be provided in the calculations.

5. Test Point: Calculations shall be brought back to the flow test point.
6. Area of Coverage and Density: The area of coverage and density for each sprinkler shall be provided in the calculations.
7. Equivalent Lengths: The equivalent lengths for all types of fitting and valve used shall be provided.
8. Supply and Demand Graph(s): A graph comparing the water supply and the sprinkler and hose stream demand for each remote area shall be provided. Pressure and flow values for the supply and demand curves are to be provided on N ^{1.85} graph paper.

1.08 SUBMITTALS

- A. Partial submittals will not be acceptable. Any installation work performed prior to the approval of the submittal shall be at the Contractor's own risk.
- B. Before any work is commenced, submit manufacturer's data (with listing or approval), system calculations, [water supply data,] and complete sets of working drawings.
- C. The Lehigh University Fire Protection Engineer shall review and approve submittals.
- D. Manufacturers' Data: Annotate descriptive data to show the specific model, type and size of each item the Contractor proposes to furnish. Include data for proper installation of each system including:
 1. Pipe and fittings
 2. Alarm valves,
 3. Gate and check valves
 4. Globe valves
 5. Backflow preventers
 6. Water motor alarms
 7. Sprinkler heads
 8. Pipe hangers and supports
 9. Pressure and waterflow switches
 10. Tamper switches
 11. Inspector's test station
 12. Strainers
 13. Post-indicator valve
 14. Retard chamber

15. Ball drip
 16. Fire department connections
 17. Lubricating compound/PTFE tape.
 18. Signs
 19. Caps, chains
 20. Cabinets
 21. Hose valves
 22. Drip pans
- E. Shop Drawings: Prepare working drawings on sheets not smaller than 24 in by 36 in (610 mm by 914 mm), in accordance with the requirements for "Working Plans" as specified in NFPA 13. A scaled site plan, with the location and elevation of the water flow test, shall be provided on the drawings. [Drawings are to include isometric diagram of sprinkler risers and feed mains, including all control valves.]
- F. As-Built (Record) Working Drawings: On a weekly basis, the Contractor Superintendent, in conjunction with the Project Manager, shall review and record as-built conditions on a set of drawings maintained at the job site. After completion, but before final acceptance of the work, furnish a complete set of as-built drawings for review and approval by Lehigh University. Make all necessary corrections to the drawings and furnish four sets of as-built drawings for record purposes. All deviations from the approved shop drawings shall be highlighted on the as-built drawings; if required by Lehigh University the Contractor shall also provide hydraulic calculations justifying deviations. The drawings shall not be smaller than 24 in by 36 in with title block similar to full size contract documents. Provide 1 compact disc containing CAD based drawings in DXF and PDF based format of all as-built drawings and schematics.
- G. Operation and Maintenance Manuals: Furnish four (4) instruction manuals containing complete operation and maintenance instructions for the specific make and model of all check valves, detector check valves, alarm valves, waterflow and tamper switches, backflow preventers, and other trim furnished. Serial numbers and ordering information shall be provided. Place one copy of each instruction manual in a flexible, oil-resistant protective binder and mount in an accessible location in the vicinity of each alarm control valve. Furnish three additional copies of each instruction manual.

1.09 QUALITY ASSURANCE

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. All publications listed below refer to the most current edition.
- B. Manufacturers Qualifications
1. American Society for Testing and Materials (ASTM) Publications:
 - a. A53 Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless
 - b. A135 Welded and Seamless Steel Pipe

2. Factory Mutual System (FM) Publications
 - a. Approval Guide
 - b. Data Sheet 2-0, Installation Guidelines for Automatic Sprinklers
 - c. Data Sheet 3-26, Fire Protection for Nonstorage Occupancies
3. National Fire Protection Association (NFPA) Publications
 - a. 13 Installation of Sprinkler Systems
 - b. 14 Installation of Standpipe and Hose Systems
 - c. 70 National Electrical Code
 - d. 72 National Fire Alarm Code
 - e. 101 Life Safety Code
 - f. 291 Fire Flow Testing and Marking of Hydrants
 - g. 1963 Fire Hose Connections
4. International Code Council (ICC)
 - a. International Building Code
5. Underwriters Laboratories, Inc. (UL) Publications:
 - a. Fire Protection Equipment Directory
 - b. 262 Gate Valves for Fire Protection Service
 - c. 789 Indicator Posts for Fire Protection Service
6. American Society of Mechanical Engineers (ASME)
 - a. A17.1 Safety Code for Elevators and Escalators

C. Qualifications Of Installer:

1. Prior to installation, submit data for approval by Lehigh University , showing that the Contractor has successfully installed automatic, wet pipe, fire extinguishing sprinkler systems of at least 200 sprinkler heads each, or there is a firm contractual agreement with a subcontractor having such required experience. These systems shall be the same type and design which have been retrofitted into existing buildings as specified herein. The data shall include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. The Contractor shall indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months.
2. Design (including hydraulic calculations) shall be by a NICET Level III or IV Technician (in automatic sprinkler system design) or a Professional Engineer (P.E.), licensed in Fire Protection

Engineering. Qualifications of the designer must be submitted to Lehigh University for approval.

- D. Service Organization: The Contractor shall furnish, to the Project Manager, evidence that there is an experienced and effective service organization which carries a stock of repair parts for the system in order to readily effect repairs throughout the warranty period. Should the Contractor fail to comply with the service requirements of this section, the University will then have the option to make the necessary repairs and back charge the Contractor without any loss of warranty or guarantee as provided by the contract documents.

1.10 DELIVERY STORAGE AND HANDLING

- A. Deliver products to project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.
- B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.
- C. Automatic sprinklers must be kept in original packaging until they are installed. Loose carrying or storage is not permitted. Loose sprinklers shall be discarded immediately and replaced at Contractor's expense.

1.11 PROJECT CONDITIONS

[List any special project conditions and/or environmental limitations on system installation, such as temperature, humidity, ventilation, etc.]

1.12 COORDINATION

- A. Coordinate sprinkler head layout with reflected ceiling plan and all ceiling – mounted equipment, including diffusers, lights, security cameras, fire alarm devices, exit signs, and other devices.
- B. Coordinate major equipment and piping layouts with other trades to avoid obstructions and excessive changes in direction for piping.

1.13 WARRANTY

- A. The Contractor shall guarantee labor, materials, and equipment provided under this contract against defects for a period of one year after the date of final acceptance of this work by the University.
- B. Final acceptance includes, but is not limited to, the receipt and Lehigh University approval of, as-built drawings and operation and maintenance manuals.

1.14 SERVICE AGREEMENT

[List requirements, if part of the contract. Confirm with Lehigh University and Project Manager].

1.15 EXTRA MATERIALS

[List special requirements for spare parts, if part of the contract. Confirm with Lehigh University and Project Manager].

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. All products are subject to the following listed acceptable manufacturers. If the product is not addressed herein the product shall be from a US based manufacturer and listed for fire protection use.
- B. All products shall be FM approved. UL listing is acceptable but shall not be considered as a substitute for FM approval..
- C. Double Check Detector Backflow Preventer Assembly
 - 1. Ames
 - 2. Watts
 - 3. Febco
 - 4. Hersey
- D. Fire Department Connections
 - 1. Allenco
 - 2. Elkhart Brass
 - 3. Potter-Roemer Inc.
 - 4. Reliable Automatic Sprinkler Co.
- E. Fire Protection Valves and Drain Assemblies
 - 1. Tyco Fire & Building Products
 - 2. Victaulic
 - 3. Stockham
 - 4. Kennedy
 - 5. Jenkins
 - 6. Reliable Automatic Sprinkler Co.
 - 7. Viking Corporation
- F. Sprinklers
 - 1. Tyco Fire & Building Products
 - 2. Reliable Automatic Sprinkler Co.
 - 3. Viking Corporation
 - 4. Victaulic Corporation

G. Valve Supervisory Switches

1. Potter Electric Signal
2. System Sensor
3. McWane, In. Kennedy Valve Div.

H. Strainers

1. Ames
2. Mueller
3. Tyco

I. Post-Indicator Valve

1. Kennedy Valve
2. Mueller
3. Nibco

2.02 ABOVEGROUND PIPING SYSTEMS

- A. Provide fittings for changes in direction of piping and for all connections. Arrange piping so that it can be drained at the main riser. Make changes in piping sizes through standard tapered, reducing pipe fittings; the use of bushings will not be permitted. Perform welding in the shop; field welding will not be permitted.
- B. Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread tape, anaerobic pipe dope, or a combination. Apply pipe dope on male threads.
- C. Lubricant used on gaskets for mechanical fittings must be non-petroleum based and approved by Lehigh University.
- D. Run piping concealed in areas with suspended ceilings, except as noted on the drawings.
- E. Sprinkler Pipe and Fittings: Provide in accordance with NFPA 13, except as modified herein. Steel piping shall be Schedule 40 per ASTM A53 for sizes less than 4 inches and Schedule 10 or 40 per ASTM A53 for sizes 4 inches and larger. ASTM A135, Schedule 40 piping may be used for pipe sizes less than 2 ½ inches.
 1. Standard Installation:
 - a. Nominal pipe sizes 4 inches or larger: Schedule 10 or 40 Pipe meeting ASTM A-53, A-135 or A-795 with factory- or field-formed, roll-grooved for Schedule 10 or 40 ends, or cut-grooved for Schedule 40 ends.
 - b. For connections between 4 inch and larger pipes the requirements are as follows.
 - 1) Grooved pipe couplings and fittings for grooved pipe.

- 2) Outlet coupling with screwed connection for grooved pipe.
- c. For connection between 4 inch and larger pipes to pipes smaller than 4 inches the requirement is as follows.
 - 1) Welded outlet with screwed connection or threaded coupling or fittings.
- d. Nominal pipe sizes smaller than 4-inches: Schedule 40 Pipe meeting ASTM A-53, A-135, and A-795 with factory- or field-formed threaded ends:
- e. For connections to and between pipes less than 4 inches the requirement is as follows.
 - 1) Threaded pipe couplings and fittings only.
- 2. Underground piping: All underground pipes shall be centrifugally cast ductile iron.
- 3. Pressure ratings: Pressure ratings of all fittings and gaskets shall meet or exceed maximum working pressures available within the system.
- 4. Corrosion protection: All piping and hangers where exposed to the weather or installed in a corrosive atmosphere shall be protected against corrosion.
- 5. Pipe and Hanger Supports: Provide pipe supports, hangers, and clamps conforming to NFPA 13 and listed by UL or approved by FM. Provide galvanized supports, hangers, and clamps for all galvanized piping.
- 6. Joint Construction
 - a. Branch outlet mechanical fittings and clamp type fittings are not permitted.
 - b. Procedures for welding outlets shall be in strict conformance with the welding requirements of NFPA 13, including submission of welding certifications. Welding shall not be performed on site.
 - c. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe with wall thickness less than Schedule 40.
 - d. Grooved Joints and Fittings: Assemble joints and fittings with listed coupling and gasket, lubricant, and bolts from same manufacturer. Fittings and attached couplings shall be from the same manufacturer.
 - e. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.
- F. Rubber-gasketed, grooved-end pipe and fittings with mechanical couplings shall only be permitted in pipe sizes 4 inches (101.6 mm) and larger.
- G. Use of restriction orifices, reducing flanges, unions, and plain-end fittings will not be permitted.
- H. The corrosion resistance ratio of pipe and fitting method shall not be less than 1.0.
- I. Pipe Hangers and Supports: Provide in accordance with NFPA 13.
- J. Identification Signs: Attach properly lettered approved metal or polycarbonate signs conforming to NFPA 13 to each valve and alarm device. Polycarbonate signs shall be red with engraved white

letters. Signs at valves shall describe the sprinkler zone it controls and state that the valve is to remain open. Permanently affix design data nameplate to the riser of each system.

- K. Inspector's Test Connection: Provide test connections no higher than 6 ft (1.83)m above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the [hydraulically most remote part of each system and at the] control valve/drain assembly. Provide combination drain valve and test connection. Discharge shall be readily visible from the inspector's test connection, either by direct observation of the discharge or through a sight glass. Discharge shall be piped to either an open building drain or to the outside. Drainage and test valves shall be bronze globe, angle, or gate valves.
- L. Drains: Provide drain piping to discharge at safe points outside the building or to sight cones attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure. All drain piping is to be galvanized. Provide auxiliary drains as required by NFPA 13. Splash guards are to be provided where necessary at discharge outlets.
- M. Pipe Sleeves and Seals. Provide where conduit or piping passes through walls, floors, roofs and partitions. Provide clearance between exterior of piping and interior of sleeve in accordance with NFPA 13. See Section 078413 Penetration Firestopping, for sleeves and seals through fire-rated assemblies. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through the entire thickness of walls, floors, roofs, and partitions.
 - 1. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide ASTM A53, Schedule 40, zinc-coated steel pipe sleeves. Sleeves in floors shall project 4 inches (101.6 mm) above finished floors to prevent seepage.
 - 2. Sleeves in Partitions and Other than Masonry and Concrete Walls, Floors and Roofs: Sleeves shall be constructed from either zinc-coated schedule 40 steel pipe or zinc-coated 26 gauge steel sheet.
- N. Escutcheon Plates: Provide one piece or split-hinge-type metal plates for piping passing through floor, walls, and ceilings in exposed and concealed areas. Provide chromium-plated or color-coordinated metal plates where pipe passes through finished ceilings. Securely anchor plates in proper position. Provide sprinkler escutcheon plates to match sprinkler head finish.

2.03 BACKFLOW ASSEMBLIES

- A. Backflow preventers shall comply with the requirements of the Bethlehem Water Department.
- B. The backflow preventer shall be of the Double Check Detector Assembly (DCDA) type with bypass meter assembly, two independently operated spring loaded check valves, top mounted test cocks, and two UL FM OS&Y resilient seated gate valves.
- C. Assemblies shall be listed for fire protection use.

2.04 SPRINKLER HEADS

- A. Provide quick response sprinklers in offices and all other areas where their use is listed or approved.
- B. Sprinkler heads located within the air streams of unit heaters or other heat-emitting equipment or skylights shall be selected for proper temperature rating.
- C. Heads shall have a nominal ½ inch (12.7 mm) orifice. Corrosion-resistant sprinkler heads shall be installed where they are exposed to the weather, moisture or corrosive vapors. Heads installed where

they might receive mechanical injury or are less than 7 feet (2.13 m) above the floor level, shall be protected with approved guards in accordance with NFPA 13. Provide finish as indicated.

2.05 VALVES:

- A. Provide valves as required by NFPA 13 and types UL listed and FM approved for fire protection service.
- B. Gate Valves: Gate valves shall be the outside stem & yoke (OS&Y) type, and open by counterclockwise rotation. Gate valves installed higher than 7 feet (2.13 m) above the floor shall be provided with a chain drive or permanently mounted ladder. Provide a gate valve beneath each alarm valve in each riser when more than one alarm valve is supplied from the same water supply pipe. [For post indicator valves, provide operating nut located about 3 feet above finish grade. Gate valves for use with indicator post shall conform to UL 262. Indicator posts shall conform to UL 789. Provide each indicator post with one coat of primer and two coats of red enamel paint.]
- C. Check Valves: Check valves shall be clear-opening, swing-check type, with a bronze or stainless steel seat ring and a EPDM rubber clapper facing. Flanged check valves of sizes 4 inch (101.6 mm) and larger shall have flanged inspection and access cover plates.
- D. [Alarm Valves: Provide variable-pressure-type alarm valve complete with an alarm test valve, alarm shutoff valve, drain valve, pressure gages, accessories and appurtenances for the proper operation of the system.]
- E. Butterfly valves: Butterfly valves are permitted only for pipe sizes of 4 inches (100 mm) and smaller.
- F. Post-indicator valve: All sprinkler and standpipe supply mains shall be provided with an exterior gate valve equipped with an indicator post. Valve location shall be coordinated with the Life Safety Supervisor.
 - 1. Indicator post shall have a target or indicator, visible through an opening in the post, shows whether the valve is open or shut.
 - 2. The indicator post shall have a cast iron barrel, an extension flange which allows the height of the barrel to be regulated, and a wrought iron or mild steel stem which operates the underground valve and simultaneously moves the target. A telescoping union shall permit turning the stem from a constant height.
 - 3. Indicator posts shall be installed on non-rising stem gate valves. Indicator posts shall be approved for use on 4 through 14 in. NPS non-rising stem gate valves with an indicator post flange.
 - 4. In all new fire protection system installations, buried valves must open in a counterclockwise direction regardless of the direction the valves of the public water system open.

2.06 FIRE DEPARTMENT CONNECTION

- A. Fire department connection shall be in accordance with NFPA 13, with self-closing clapper valve in each inlet. The siamese connection shall be polished brass [bronze], [with polished chromium finish].
- B. Connection shall include check valve, automatic drip (to drain to outside or building drain), caps and chains, 2 ½ inch (63.5 mm) female fire hose thread connections with Bethlehem threads, and nameplate.
- C. Nameplate shall be positioned so it is clearly visible and shall state the type of connection and the system(s) it serves.

2.07 ALARMS

- A. [Paddle-Type Water Flow Switches: Provide paddle-type water flow switches [as indicated on the drawings]. Switches shall have sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler head. Water flow switch mechanisms shall incorporate an instantly recycling, pneumatic, adjustable retard element and shall be set with a 20-second delay. Assembly shall be rated at 175 psi cold water pressure. Switches shall be compatible with the fire alarm system and shall be connected per Section 283111.]
- B. [Pressure Switch: Provide switch [as indicated on the drawings] with circuit opener and closer for automatic transmittal of an alarm over the facility fire alarm system and connect into the fire alarm system per Section 283111. Alarm actuating device shall be of the mechanical diaphragm, controlled water, pressure-type, without retard device, which instantly recycles when pressure is released from the diaphragm. Switches shall be compatible with the fire alarm system.]
- C. Valve Supervisory Switch: Valve supervisory switches shall be installed on all sprinkler control valves. The switches shall be mounted so as not to interfere with the normal operation of the valve and shall be adjusted to operate within two revolutions of the valve control or when the stem has moved no more than 1/5 of the distance from its normal open position. The mechanism shall be contained in a weather-proof, die-cast, aluminum housing that shall be provided with a ½ inch (12.7 mm) tapped conduit entrance and incorporate the necessary facilities for attachment to the valve. Switch housing shall be finished in red baked enamel. The entire installed assembly shall be tamper-proof and arranged to cause a switch operation if the housing cover is removed or if the unit is removed from its mounting. Devices shall be compatible with and connected to the fire alarm system per Section 283111.
- D. All post-indicator valves shall be furnished with a valve supervisory switch for monitoring by the building fire alarm system.

2.08 CABINET

- A. Furnish and install a metal cabinet containing a stock of spare sprinkler heads of all types and ratings installed. The cabinet shall be located near the [alarm][control] valve and where the temperature will not exceed 100°F(37.8°C) The number of spare sprinkler heads shall be as required by NFPA 13

2.09 STRAINER

- A. Provide a strainer on the sprinkler system water supply main in the building. Strainer shall be sized based on the incoming service main, the system demand, and the anticipate pressure drop across the strainer.
- B. Strainer shall have a maximum pressure loss of 10 psi under the anticipated flow conditions.
- C. Strainer shall have a blow-off or clean-out connection for servicing, and shall have cover to allow removal of the strainer basket without complete dis-assembly from the service main.
- D. Strainer shall be UL- listed and FM-Approved for the proposed orientation.

2.10 STANDPIPE VALVES

- A. General: Provide bronze hose valves that are gate or angle type with screw-in bonnets, and 2-1/2 inch threaded male outlets with 1-1/2 inch adapters. Brass caps and chains are to be provided for each outlet. Valves and adapters are to have [National Standard threads][local fire department threads].

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Equipment, materials, installation, workmanship, examination, inspection and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Install piping as close to the ceiling as possible, without interfering with other equipment and construction. Nipples shall be perpendicular to ceilings.
- B. Accurately align sprinkler heads in suspended ceilings symmetrically with diffusers, lights, and ceiling tiles. Install sprinkler heads in the center of the ceiling tiles unless directed otherwise.
- C. Keep the interior and ends of all piping affected by Contractor's operations thoroughly clean of water and foreign matter by means of plugs or other approved methods. Inspect piping before placing into position. All pipe, fittings, and gaskets are to be cleaned of oil prior to installation.
- D. Strainers shall be installed on all fire service mains.
- E. All post-indicator valves shall be locked in the open position and electronically supervised. Coordinate all locks with Lehigh University.

3.02 FIELD CHANGES

- A. Do not make field changes in the piping layout, pipe sizes, or type of equipment, without the prior approval of the Project Manager.

3.03 CONNECTIONS TO EXISTING SPRINKLER SYSTEM

- A. Connection to the existing sprinkler system shall be done only after successfully testing new piping. Connections shall be as shown on the drawings. The Project Manager shall be notified at least 4 days prior to interruption of sprinkler protection.
- B. A schedule of any interruption of service shall be provided to the Project Manager and approval received before any service is interrupted. In no case shall the existing sprinkler system be shut off during periods other than normal Contractor construction hours.

3.04 FIELD PAINTING

- A. Painting shall be per Section 099000, Painting, except as modified herein. The above-ground steel piping systems including valves, piping [in finished areas], pipe sleeves, conduit, hangers, miscellaneous metal work and accessories shall be cleaned, pre-treated, primed and painted. Coatings shall be applied only to clean, dry surfaces using clean brushes. Surfaces shall be cleaned to remove all dust, dirt, rust and loose mill scale.
- B. Immediately after cleaning, provide the metal surfaces with one coat of primer, applied to a minimum dry film thickness of 1.0 to 1.5 mil. Due care shall be exercised to avoid the painting of sprinkler heads or protective devices or allowing paint to drip or splatter on any equipment, artifacts, building structures, and floors. Materials which are used to protect sprinkler heads while painting is in progress shall be removed upon completion of painting.
- C. The Contractor shall remove all sprinkler heads which are painted and provide new, clean sprinkler heads of the proper type at his own expense. In addition to the primer, surfaces shall receive the following:

- D. Above-Ground Piping Systems in Unfinished Areas: Unfinished areas are defined as attic spaces, mechanical equipment spaces, spaces above suspended ceilings, crawl spaces, pipe chases, and spaces where walls or ceilings are not painted or not constructed of a pre-finished material. [Provide primed surfaces with one coat of red enamel.][Provide 2 inch (50.8 mm) wide red enamel or self-adhering plastic bands on sprinkler piping, spaced at a maximum of 10 ft. (3.05 m) intervals.]
- E. Above-Ground Piping Systems in Other Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except valves and operating accessories shall receive one coat of red enamel. Provide piping with 2 inch (50.8 mm) wide red enamel bands or self-adhering red plastic bands spaced at a maximum of 10 ft (3.05 m) intervals. In finished areas such as offices, the red bands may be omitted.
- F. All other coatings (e.g., zinc for galvanized pipe) shall be in compliance with NFPA 13.

3.05 FIELD TESTING AND FLUSHING

- A. All testing shall be scheduled with the Project Manager.
- B. At the discretion of the Lehigh University Fire Protection Engineer, an air pressure test may be required prior to filling the system with water. The test shall be conducted by raising the air pressure in the system to 40 psi and allowing it to stand for 24 hours. There shall be no loss of air pressure greater than 1.5 psi over the 24 hour period.
- C. Hydrostatic tests shall be conducted at 200 psi for a 2 hour period with no leakage or reduction in gage pressure. Hydrostatic test pressures shall not be maintained on the system overnight. Flush piping with potable water in accordance with NFPA 13.
- D. Preliminary Tests and Procedures: Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. [Prior to the hydrostatic test, perform an air test on the system.] [In areas where piping will be concealed by ceilings, walls, or other construction before the system is complete and ready for final testing, the preliminary hydrostatic test shall be conducted prior to piping being concealed. This test shall be witnessed by the Project Manager and the Lehigh University Fire Protection Engineer.] When all tests and procedures are completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13, with a request for formal inspection and tests.
- E. Formal Inspection and Tests: At this time, all piping sprinklers, and other system components shall be in-place and all adjustments to the system completed. The Lehigh University Fire Protection Engineer shall be notified by the Project Manager and shall witness all tests and approve all systems before they are accepted. Submit a request for a formal inspection at least five working days prior to the date the inspection is to take place. A competent representative of the sprinkler installer shall be present during testing and inspection. As-built drawings shall be on-site for the inspection. At this inspection, the system shall be hydrostatically tested. Any or all of the required tests shall be conducted by the Contractor at his own expense and additional tests made until it has been demonstrated that the systems comply with all contract requirements. The Contractor shall furnish all appliances, equipment, instruments, connecting devices and personnel for the tests. Any costs incurred by the University for repeat tests, due to the failure of the Contractor to adequately demonstrate that the system complies with the contract requirements, shall be borne by the Contractor.
- F. CONNECTIONS TO EXISTING PIPING: During air and hydrostatic testing, the Contractor shall test new piping prior to connecting to the existing system. If the Contractor chooses to test the new piping while it is connected to existing piping or valves, the Contractor shall assume responsibility

for all piping and equipment which is pressurized, as well as any damage caused by the failure of existing or new sprinkler systems. The University accepts no responsibility for existing valves' performance to withstand hydrostatic pressure testing.

END OF SECTION 211313