SECTION 21 13 16 – PreAction sprinkler Systems

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
          2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
       2. SUMMARY
          1. Perform all Work required to provide and install pipe, fittings, valves, connections, hangers, supports, sleeves, appurtenances, detection control panel, detection devices, notification devices and interface equipment for complete preaction system with all supplementary items necessary for complete, code compliant and approved installation.
          2. This section covers design equipment, installation, testing and all materials required for the preaction fire sprinkler protection system.
          3. Contractor shall be responsible for the complete system design, layout, hydraulic calculations, and preparation of shop drawings, field installation, coordination and completion in accordance with project requirements and applicable codes and standards.
          4. Work or equipment not indicated or specified which is necessary for the complete and proper operation of the work of this section in accordance with the true intent and meaning of the contract documents shall be provided by this Contractor and incorporated under this section of the work at no additional cost to the owner.
          5. Contractor shall include within his bid all materials and work to provide complete preaction system, preaction detection panel and devices, and 100% sprinkler protection for all areas covered by the preaction system.
          6. The preaction system shall be a standard single interlock or double interlock type.
          7. Size all branches and mains by hydraulic calculations. Contractor shall provide a water flow test at the Site to determine actual available volume and pressures as a design basis for system and storage tank replenishment. Hazard classifications for fire protection system design, installation and water supplies shall be in accordance with NFPA Standards.
          8. Interface preaction detection control panel with building fire Alarm system.
          9. Preaction fire detection and notification devices shall be dedicated for the preaction system and are not intended to provide coverage for the building fire alarm system.
          10. Provide temporary fire protection during the construction phase of Project. Obtain approval from the Owner and General Contractor for any interruptions of the fire protection system prior to each and every shutdown.
       3. REFERENCE STANDARDS
          1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
          2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
          3. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

Factory Mutual System (FM) - Approval Guide and Loss Prevention Data Sheets

NFPA 13 - Installation of Sprinkler Systems

NFPA 14 - Installation of Standpipe and Hose Systems

NFPA 24 - Private Fire Service Mains

NFPA 25 -Inspection, Testing and Maintenance of Water-Based Fire Protection Systems

NFPA 70 - National Electric Code

NFPA 72 - National Fire Alarm Code

State of Missouri, State Fire Marshal Rules.

Authority Having Jurisdiction (AHJ), Fire Department Standards.

* + - * 1. Test system in accordance with requirements of the authority having jurisdiction with the fire inspector present for system certification.
      1. QUALITY ASSURANCE
         1. Standpipe and sprinkler system design, testing; cleaning, certification, materials, equipment and installation shall meet the requirements of the latest editions of Referenced Standards.
         2. Obtain and become familiar with requirements of Owner's insurance underwriter, and incorporate all applicable provisions for compliance.
         3. Thoroughly and clearly document all Project related communications with code and regulatory agents and expediently forward communication documentation to the Owner’s Project Manager.
         4. Equipment and components shall bear FM label or marking. Provide manufacturer’s name and pressure rating marked on valve body.
         5. All hose threads, coupling types, etc., utilized in the fire protection systems shall conform to the standards and requirements of the AHJ Fire Department.
         6. Maintain at least one copy of all system related documents on Site.
         7. Design sprinkler system under direct supervision of a R.M.E.’s (Responsible Managing Employee) experienced in design of this Work and licensed in the State of Missouri. All design submittal documents and Shop Drawings shall bear the R.M.E.’s signed and dated registrations number. The system shall be installed by a firm having minimum three years experience regularly engaged in the design and installation of automatic fire protection systems in accordance with requirements of the National Fire Protection Association and the State of Missouri Fire Marshal’s office. Evidence to support the above requirements shall be submitted with Shop Drawings. Working plans shall be sealed by an engineer registered by the Missouri State Board for Professional Engineers in fire protection specialty.
         8. No Work shall be performed until the Shop Drawings and product data have been approved by the Engineer of Record. This will require early processing of all submittals. The Contractor is solely liable for any Work performed or material purchases made prior to this approval.
      2. SUBMITTALS
         1. General:

No Work shall be performed until the Shop Drawings, calculations and product data have been approved by the Engineer of Record and the Owner's insurance underwriter. This will require early processing of all submittals. The Contractor is solely liable for any Work performed or material purchases made prior to this approval.

* + - * 1. Product Data:

Provide data on sprinkler heads, piping materials, joining methods, supports, valves, flow switches, tamper switches and all other components and accessories intended to be installed. Include manufacturers’ catalog information, Code and Standards compliance, performance ratings, rough-in details, weights, finishes, support and connection requirements.

Submit one of each style of sprinkler head proposed.

* + - * 1. Sequence of Operations

Submittal shall include a complete written sequence of operations of all functions of the system.

In addition to the written sequence of operations, all sequence functions shall be depicted using a sequence of operations matrix chart of all functions showing how the system will react to the activation of each type of device.

Submittal shall include details of all interfaced functions. Details shall include all fire detection system functions and interconnections applicable to each interface.

* + - * 1. Record Documents

Submit preliminary layout showing head locations within coordinated ceiling grid and inspector's test station locations for review by Architect/Engineer, Owner’s Project Manager and EH&S.

Submit certification letter by engineer of record stating that the fire protection systems design and installation complies with Referenced Standards.

Submit verification of Contractor’s design and installation qualifications.

Provide full written description of manufacturer’s warranty.

Provide certificate of compliance from authority having jurisdiction indicating approval of field acceptance tests. Refer to paragraph 3.04 B, within this specification section.

Shop Drawings:

Submit detailed and accurate Shop Drawings of entire systems prior to fabrication. Indicate system controls, hydraulic reference points, detailed pipe layout, valves, hangers and supports, components and accessories.

Hydraulic calculations: Submit flow test results and comprehensive hydraulic data sheets complying with NFPA 13. Verification of the adequacy of water pressure and other pertinent water supply data shall be the responsibility of the design engineer.

Sprinkler heads shall be shown on Drawings and specifically identified by the style or series designation as published in the appropriate agency listing or approval.

Floor plans showing the entire project area, all fire alarm devices (new and existing) and conduit and wire run.

As-Built Drawings:

Provide three sets of As-Built Record Drawings indicating actual installed locations, sizes and types of sprinkler heads, piping, valves, supports, equipment and all other system components. Identify all deviations from approved submittal Drawings. Provide two sets of final hydraulic calculations and ACAD, version 13 or later, discs of As-Built Drawings.

* + - * 1. Owner’s Pricing Detail:

Submittal shall include a complete bill of materials listing all material quantities and unit prices identifying components by manufacturer’s part number.

Submittal shall include the unit costs and extended costs of each item listed in the bill of materials.

Contractor shall submit separately and directly to Owner a pricing breakdown of all cost associated to Project for review. This is to include but not be limited to material quantity, description, unit list price, multiplier, cost, extended cost, material costs adjustment less Owner’s discount price, outside material price totaled and itemized, itemized subcontract price associated to Project, and total Project support price.

Contractor labor hour quantities shall be itemized by mechanical labor, electrical labor, field programming labor and design and management labor. Hour quantities shall be itemized by journeyman rate, technician rate and design/management rate with quantity of hours listed separately.

All estimated overtime shall be disclosed. Profit for Project shall be disclosed. Total Project price shall not exceed the sum of the listed itemized costs.

This pricing summary, including any attachments, is intended only for the Owner and contains confidential and/or privileged information. Any unauthorized review; use, disclosure or distribution is prohibited.

* + - * 1. Operation and Maintenance Data:

Include components of system, servicing requirements, inspection data, replacement part numbers, location and numbers of service depot. Provide a preventive maintenance schedule for all applicable equipment and systems.

Include complete operating and maintenance instructions for fire detection panel and components.

* + - 1. DELIVERY, STORAGE and HANDLING
         1. All materials shall be new, undamaged, and free of rust. Protect installed piping, valves and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc.
         2. Accept valves on Site in shipping containers and maintain in place until installation. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.
         3. Protect all materials that are to be installed within this Project from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for exterior locations.
      2. EXTRA MATERIALS
         1. The Contractor shall provide supply of spare heads of each type installed under the Contract in quantities as required by National Fire Protection Association Standard No. 13. The heads shall be packed in a suitable wall mounted sprinkler cabinet and shall be representative of and in proportion to, the number of each type and temperature rating installed. In addition to the spare heads, the Contractor shall provide not less than three special sprinkler head wrenches for each type of head. The cabinet shall be located where directed by the Owner.

1. PRODUCTS
   * + 1. GENERAL
          1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
          2. All piping, materials and equipment used in the installation of sprinkler and standpipe systems shall be new and listed as approved by the Underwriters’ Laboratories, Inc., List of Inspected Fire Protection Equipment and Materials and the Factory Mutual Testing Laboratories List of Approved Equipment, Fire Protection Devices and Devices Involving Fire Hazard and shall be the latest design of the manufacturer.
          3. Pressure ratings of pipe, fittings, valves, gauges and all other water carrying appurtenances shall be suitable for the anticipated system pressures in which they are installed.
          4. The installing Contractor shall identify piping, fire department connections, valves and hydraulic design information in accordance with applicable NFPA Standards.
       2. manufacturer
          1. Sprinkler Heads: Reliable, Grinnell, Viking.
          2. Flow Switches: Notifier, Potter-Roemer, System Sensor.
          3. Tamper Switches: Notifier, Potter-Roemer, System Sensor.
          4. Gate Valves: Mueller, Nibco, Stockham, Kennedy.
          5. Butterfly Valves: Milwaukee, Nibco, Grinnell, Victaulic, Kennedy.
          6. Ball Valves: Milwaukee, Nibco, Stockham, Victaulic.
          7. Check Valves: Mueller, Nibco, Stockham, Grinnell, Victaulic.
          8. Grooved Fittings and Couplings: Grinnell, Anvil, Victaulic.
          9. Hose Valves: Elkhart, Larsen, Potter-Roemer.
          10. Fire Department Connections: Elkhart, Larsen, Potter-Roemer.
          11. Electric or Water Motor Alarm Bells: Potter-Roemer, Reliable, Victaulic, Grinnell, Viking.
          12. In-Building Water Supply Riser: Ames.
          13. Detection Control Panel: Fike
       3. Sprinkler heads
          1. Unless otherwise specified or indicated on the Drawings, sprinkler heads shall be automatic closed type spray heads with temperature ratings as required by National Fire Protection Association Standard No. 13.

Sprinkler heads shall be quick-response type.

Where there are no listed quick response sprinklers in the temperature range required, standard response sprinklers shall be permitted to be used.

Finished Ceilings: Provide concealed ceiling sprinklers with factory finished (no field painting) cover plate, color to match ceiling finish. [Exception: Provide listed chrome plated or alternate color cover plates where directed by Architect].

Unfinished Areas Without Ceilings: Provide bronze upright. Protect sprinkler heads against mechanical injury with standard guards where required.

Cold Rooms (≤ 42°F.) and Areas Below Heated Ceiling/Soffit Spaces Susceptible to Freezing shall not be protected by a preaction type sprinkler system.

Elevator Equipment Rooms: Provide 212°F intermediate temperature classified heads.

MRI Rooms: Provide non-ferrous semi-recessed chrome plated head and escutcheon.

* + - 1. Piping materials
         1. Unburied pipe shall be schedule 40 (minimum thickness) black steel. Fittings shall be threaded malleable or cast iron, flanged cast iron, welded black steel, grooved ductile iron with gaskets and mechanical fasteners.

Exception: All piping within MRI rooms and MRI room ceiling spaces shall be Type “K” hard drawn copper with wrought copper or bronze pressure fittings and brazed joints.

All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

All piping materials downstream of the preaction valve shall be galvanized steel.

* + - 1. valves
         1. Similar types of valves shall be the product of one manufacturer; i.e., all butterfly valves shall be of the same manufacture, all ball valves shall be of the same manufacture, etc.
         2. All valves used to control the flow of water to and within standpipe and sprinkler systems shall be listed indicating type complete with electric supervisory switches. Coordinate wiring with the electrical Contractor.
      2. FIRE DETECTION PANEL
         1. Small Preaction Systems

For small preaction systems serving a single zone and having not more than Forty SLC devices the Fike Cheetah Xi 50 detection control panel shall be used.

* + - * 1. Large Preaction Systems.

For Larger systems serving multiple areas or zones or having more than Forty SLC devices the Fike Cheetah Xi panel shall be used.

Where the large Xi panel is used a remote LCD annunciator shall be installed in the building fire command room. If the building has no fire command room the annunciator shall be installed adjacent to that building’s fire alarm control panel.

* + - * 1. PEREPHIALS

Smoke Detectors

A Fike Photoelectric smoke detector model # 63-1052 shall be used for detection.

A Fike 6 inch flanged detector base model # 63-1054 shall be used for the detector base.

A Fike model 63-1056 duct detector shall be used where duct detection is specified or required. Where the duct detector’s alarm led cannot be readily observed a remote indicator shall be installed. The remote indicator shall be wall mounted.

The detection system shall include the Configuration IR Tool Part # 55-051.

1. EXECUTION
   * + 1. INSTALLATION
          1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
          2. All installation shall be in accordance with manufacturer’s published recommendations.
          3. Install all materials and products in accordance with manufacturer’s published recommendations. Use tools manufactured for the installation of the specific material or product.
          4. Sprinkler heads shall be located in a symmetrical pattern related to ceiling features such as grid, beams, light fixtures, diffusers, etc. and where applicable, heads shall be located symmetrically with the ceiling grid, centered in two directions. Locate heads to provide code required distances away from lights, exit signs, etc., and all other items that could interfere or effect sprinkler discharge.
          5. Apply temporary protective covers during construction to ensure that sprinkler heads and escutcheons do not receive field paint.
          6. Protect sprinkler heads susceptible to mechanical injury with standard guards.
          7. Inspector's test valves shall be installed for each flow switch and located in areas non-accessible by the public, patients or unauthorized personnel and as approved by Owner. Discharge water shall be piped to suitable drain having sufficient capacity to accept discharge.
          8. Provide hangers for horizontal piping at intervals not exceeding twelve feet for pipe sizes 1-1/4" and smaller or fifteen feet for pipe sizes 1-1/2" and larger, and as recommended within NFPA.
          9. Route piping in orderly manner, plumb and parallel to building structure and concealed above ceilings where possible. Locate concealed valves, switches and alarm connections in accessible location, and coordinate size and location of access panels/doors with General Contractor.
          10. Install piping to conserve building space and not interfere with use of space and other Work. Coordinate with other trades to avoid conflicts and provide all required offsets, piping, auxiliary drains, etc. to properly install system.
          11. Group piping whenever practical at common elevations.
          12. Install piping to allow for expansion and Contraction without stressing pipe, joints or connected equipment.
          13. Pipe joints, clamps, groove couplings, flanges, unions, etc., shall not directly contact or be encased in concrete, or be located within wall, floor or roof penetrations.
          14. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
          15. Prepare pipe, fittings, supports and accessories for finish painting where required.
          16. Provide thrust blocking and clamps for mechanical joint or gasketed underground water pipe at fittings with 3/4" rods and properly anchor and support.
          17. Do not penetrate building structural members unless indicated otherwise on Contract Drawings.
          18. Each pipe projecting through roof shall be installed in accordance with Contract Specifications and Drawings. Penetrations shall be sealed air and water tight. Refer to details on Contract Drawings and coordinate with General Contractor for flashing requirements.
          19. Penetrations through fire rated walls, floors and partitions shall be sealed to provide a U.L. rating equal to or greater than the wall, floor or partition.
          20. Seal all penetrations through exterior building walls and grade beams air and watertight.
          21. Install valves with stems upright, not inverted. All valves shall be located such that the removal of their bonnets is possible. Valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. Valves shall be installed as nearly as possible to the locations indicated in the Construction Drawings. Any change in valve location must be so indicated on the Record Drawings. Remove protective coatings after installation.
          22. Provide drain valves at main shutoff valves, low points of piping and apparatus.
          23. Locate and secure hose cabinets plumb and level. Locate angle valve in cabinet at 60 inches above floor.
          24. Provide two-hour enclosure around all fire standpipe piping routed outside fire stairwell.
          25. All piping shall be clean when it is installed. Before installation it shall be checked, upended, swabbed, if necessary and all rust or dirt from storage or lying on the ground shall be removed. Flush entire system of foreign matter.
          26. Heat generated by welding or soldering procedures shall not be transmitted to valves, groove couplings, or any other components installed within the piping system that may be damaged due to high temperatures. Contractor shall take all precautions necessary and allow heated piping to cool to ambient temperature before attachment.
          27. All screw joints shall be made with taper threads, properly cut. Joints shall be made tight with Teflon tape or non-toxic joint compound applied to the pipe threads only and not to fittings. When threads are cut on pipes, the ends shall be carefully reamed to remove any burrs. Before installing pipe that has been cut and threaded, the lengths of pipe shall be upended and hammered to remove all shavings and foreign material.
       2. Detection system installation
          1. Detection system installation shall comply with NFPA 13, NFPA 70, NFPA 72 and as applicable.
          2. Installation of the fire detection panel and peripherals shall comply with the Execution section of Division 28 00 30 Fire Alarm and Smoke Detector System.
          3. Where separate contractors are used to provide the sprinkler portion and the detection portion of the preaction system, both contractors are required to coordinate the installation activities to ensure a complete and compliant preaction system.
          4. Detection panels shall not be installed in locations where water damage may occur due to routine system testing or maintenance operation or preaction system charging.
          5. Electronic control modules or NAC modules shall not be mounted above ceilings. Modules shall be accessible without ladders or special equipment. Modules shall be identified as to circuit number and function.
          6. The detection system shall be interfaced with the building fire alarm system. The detection system shall have three interface relays mounted adjacent to the detection panel. The interface relays shall not be mounted above or below the detection panel. The relays shall provide detection alarm, supervisory and trouble signals for the building fire alarm system.
          7. Wherever relays are used to interface with control functions the relay shall include an LED indicator which indicates the activated state of the relay. The LED indicator shall allow for visual verification of relay activation without disassembly of the relay or the relay enclosure. Where the relay or electronic module’s led cannot be observed without lifting ceiling tiles a remote indicator shall be installed. The remote indicator shall be wall mounted except where a hard ceiling is available. Remote indicators mounted in ceiling tiles shall not be acceptable. If necessary to provide this visual indication of relay activation, a second relay and 24 volts control power may be required in addition to the module relay.
       3. welded piping
          1. All welding materials, procedures, qualifications and records shall comply with applicable NFPA requirements
       4. system testing and flushing
          1. Testing, cleaning, flushing and inspection shall be done in accordance with NFPA requirements.
          2. The installing Contractor shall complete and sign the appropriate Contractor’s Material and Test Certificates included within NFPA 13 and 14. Tests and signing of test certificates shall be witnessed by a BJC HealthCare Planning, Design and Construction representative or designee.
       5. zoning
          1. All flow switches and tamper switches shall relay their activation to each annunciator panel and the main fire alarm panel.
          2. Sprinkler system zoning shall coincide with building smoke compartmentalization unless noted otherwise on Contract Drawings. As a minimum, each floor level shall be a separate zone.
       6. training
          1. Contractor shall provide for the service of a competent, trained and experienced agent to instruct and acquaint the Owner with the proper functioning, operation and maintenance of the fire protection systems and all installed components.
       7. warranty
          1. The complete system shall be warranted in writing against defects in materials or Workmanship under normal use and service for a period of one year after date of Substantial Completion.

END OF SECTION 21 13 16