**Jefferson County School District, R-1**
**Support Services**

# TECHNICAL GUIDELINES

# DIVISION 21 – FIRE SUPPRESSION

**AUGUST 2022**

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# DIVISION 21 – FIRE SUPPRESSION

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- The work under this Section includes furnishing all fire suppression equipment, piping, accessories, specialties, and all labor necessary to provide and install the complete installation of an approved Fire Suppression System.
- General:
    1. The facility shall be protected by an automatic fire sprinkler system unless specifically excluded under NFPA-13 or otherwise approved in writing by the AHJ.
        a. Areas of the facility only when required by current Code and as accepted by the State.
        b. Partial coverage may be acceptable in coordination with the AHJ and the District Project Manager.
    2. All sprinkler and standpipe systems shall be calculated to verify proper pipe sizes in strict accordance with NFPA-13. A safety factor of ten (10) psi shall be included in hydraulic calculations.
    3. The design shall include a Double Check Back Flow Prevention device in the hydraulic calculation.
- Compliance, Design, and Installation:
    1. Design and installation of an automatic fire sprinkler system shall meet or exceed the requirements of all building and fire codes, laws, and regulations as required by the State of Colorado and the local AHJ for the size and type of system required.
    2. Coordinate with other design disciplines to ensure a fully coordinated design and installation.
    3. Existing Equipment: When an existing system is being expanded, include enough detail of the existing system on plans for a completely coordinated system:
        a. Sprinklers (make/model/etc.)
        b. Piping
        c. Valves (make/model/etc.)
        d. Mechanical Fittings (make/model/etc.)
    4. Existing System Evaluation
        a. Evaluate existing system equipment and components for potential reuse and confirm compliance with current codes and the following:
            - Conduct surveys prior to design development documents to determine and specify the extent to which the existing systems and devices shall be reused.
            - Prior to reusing existing equipment or piping systems, all such equipment and systems shall be tested and inspected by an agency or company certified to inspect the types of systems present.

- Testing and Certification shall, at a minimum, include:
  - Sprinkler heads
  - Pipe Schedules
  - Electrical Devices
  - Specialty Valves
  - Flow Switches
    - Replace if more than 5 years old

5. Each fire suppression system shall be monitored by the building fire alarm system
   a. Fire maps: Coordinate fire map requirements with the fire alarm system and with requirements of the AHJ and the District Project Manager. Indicate fire protection zones on map.
6. Locations of fire sprinkler piping and heads shall be coordinated with other design disciplines and the District Project Manager.
   a. To the greatest extent possible, all fire sprinkler piping shall be concealed. Where there is a need to expose any piping, obtain approval of the District Project Manager. All exposed piping and accessories shall be painted.
   b. If exposed fire sprinklers and associated piping are necessary and approved by the District Project Manager, piping shall be located on the perimeter of all classrooms and all other occupied rooms.
   c. Final locations of all exposed fire sprinkler heads shall be approved by the District Project Manager.
7. Coordinate work with the Fire Alarm System.
8. If required by the system type, include the complete design and installation of an electric Fire Pump, Jockey Pump, Compressor, and all associated components.

- System Design Parameters – Pipe Systems
  1. Wet pipe systems (Preferred):
     a. Shall be used in the majority of system applications.
     b. Auxiliary drains must be accessible and their location identified.
  2. Dry pipe systems:
     a. For use in heated and unheated areas susceptible to freezing conditions such as attic or concealed areas.
  3. Antifreeze Systems:
     a. Prohibited.
  4. Deluge Systems:
     a. The deluge valve assembly, including the valve, trims packages and actuation system, shall be designed and installed as a complete assembly.
     b. Fire detection spacing for deluge systems shall be in accordance with NFPA 72 including applicable appendices. Coordinate with the fire alarm system.
     c. Deluge valve actuation by electronic means shall be compatible with the building fire detection system. This includes but is not limited to detection, manual pull and releasing means for the deluge water curtain protecting the proscenium opening.
  5. Exposure Protection Systems:

a. Allowed only with direction from the AHJ and the District Project Manager.

6. Elevator and Electrical Equipment:
    a. As required by the system type and as approved by the local AHJ.
7. Protection For Mechanical Shafts:
    a. As required by the system type and building construction type.
8. System Drainage: All low system low points shall have accessible drains and shall be labeled with a phenolic label (red with white lettering), mechanically attached.
9. Locations:
    a. Classrooms, Office, Restrooms, Auditoriums, and Corridors:
        - Concealed to the greatest extent possible. Coordinate with ceilings, HVAC, lighting, and other ceiling-mounted devices.
    b. Gymnasiums: Locate way from all activities and provide piping and sprinkler head protection. Locate a minimum of four (4) feet away from climbing equipment including, but not limited to ropes, climbing walls, etc.
        - Sprinkler mains, branches and sprinkler heads shall not to be located where they may interfere with retractable basketball hoops, nets, retractable gym dividers, mat hoists, etc.
    c. Stairway Sprinklers:
        - Concealed to the greatest extent possible. Provide fire sprinkler head protection if exposed.
10. Coring, Patching and Painting:
        - Coring and Patching:
            - Carefully core all penetrations through walls, floors, and ceilings. Prior to coring, confirm locations of all conduit, piping, and other items.
            - Patch any holes or surface damage to adjacent surfaces caused by the work. Provide all cutting, patching, and sealing of surfaces in a manner approved by the District Project Manager. Fire rated assemblies shall be properly sealed where piping penetrates floors, walls, ceilings, and structure.
            - Provide and install all necessary blocking/backing required for the work.
        - Painting:
            - Paint all patched areas and exposed system components. Reference Division 9.

- Quality Assurance
    1. Code Compliance Products, General: Comply with local and state governing regulations.
        a. NFPA Code Compliance: As required based on fire sprinkler system type, at a minimum comply with NFPA-13, NFPA-14, and NFPA-20.
        b. Comply with NFPA-24 for exterior hydrants.

c. Screw Thread Connections: Comply with NFPA-194. Comply with local AHJ regulations for sizes, threading and arrangement of connections for AHJ equipment to standpipe systems.
d. FM and UL Compliance: As required for a complete system

2. Designer, Contractor, and Installer Qualifications:
   a. Designer Qualifications:
      - Colorado registered Professional Engineer with a minimum of five (5) years' experience in fire suppression systems of the type required.
   b. Contractor Qualifications:
      - Contractor shall have five (5) years minimum experience on projects equal to or greater in size to the subject project.
      - Contractor shall have an established office within 100 miles of the School District, and shall maintain a full complement of spare parts, tools and equipment for the specific project and type of system.
      - Job Foremen shall be trained for the installation and operation of each type of system and possess documentation of qualifications and training. Job Foremen shall have a minimum of three (3) years of successful installation experience on projects with fire suppression systems similar in scope and nature to that required for the project.
      - Contractor shall have the capability of providing full service maintenance, testing and inspection program in accordance with NFPA standards and where applicable, and shall be certified to perform these services.
   c. Installer Qualifications
      - Sprinkler Fitters shall be registered and in good standing with the State of Colorado, Division of Fire Prevention and Control.
      - Sprinkler Fitters shall only work under the employ of a registered Fire Suppression Systems Contractor or be employed and registered as a Fire Suppression Systems Contractor.
      - Welders shall comply with the requirements of AWS D10.9, "Specifications of Qualifications of Welding Procedures and Welders for Piping and Tubing Level AR-3":

- Manufacturers and Products:
  1. Provide products approved and tested for use in the types of systems designed.
  2. Sprinkler Pipe:
     a. ASTM A53 and ASTM A795 for black steel pipe
     b. All piping shall be USA manufactured Schedule 10 steel piping for 2 ½ - inch and larger, and Schedule 40 steel for all piping 2-inches and smaller.
        - Carbon Steel Pipe with factory- or field-formed threaded or grooved ends.
  3. Sprinkler Pipe Connections:
     a. Cast-iron threaded fittings.

b. Steel Threaded Pipe Nipples: Schedule 40, seamless steel pipe, carbon steel pipe.
c. Pipe joining: Fittings shall comply with NFPA-13 requirements. Grooved couplings, fittings, and gaskets used throughout a system shall be supplied from the same manufacturer and be designed for the specific installation.
d. Threaded fittings are preferred in architecturally exposed or sensitive areas.
e. Threaded and roll grooved pipes are subject to the limitations of NFPA-13.
    - Exclude cut grooved pipes
f. Face bushings are prohibited
g. Except where specifically approved by the District Project Manager, hexagonal bushings are prohibited. Hexagonal bushings shall not be used where a reducing fitting is normally available.
h. CPVC piping is prohibited.

4. Automatic Sprinkler Heads:
    a. The same model, manufacturer and orifice size shall be used throughout the project
    b. Temperature rating classification: Ordinary, unless required otherwise, based on ambient conditions.
    c. Provide dry sidewall heads for all Loading Docks, canopies, or areas requiring freeze-proof heads.
    d. Provide upright or pendant heads for all unfinished areas.
    e. Corrosive atmospheres: coated to prevent deterioration.
    f. Other areas (non-finished): brass finish, ordinary temperature rating.
    g. Mechanical rooms/attics: brass finish, intermediate temperature rating.
    h. Localized areas with potential for freezing: dry pendant or dry sidewall sprinklers.
    i. Acceptable Manufacturers:
        - Any manufacturer meeting the criteria of this Section
5. Valves:
    a. General:
        - Suitable for a minimum of one hundred seventy-five (175) psi working pressure, unless the project requirements demand higher pressures, i.e., fifty (50) psi above the anticipated system pressure
    b. Check Valves:
        - 1-1/2” and smaller: all bronze with screwed ends.
        - 2” and larger: iron or brass body
    c. Miscellaneous Valves:
        - Ball drip valves: brass with ½” NPT rated for one hundred seventy-five (175) psi or higher where necessary.
        - Inspector’s test valves: Minimum 1” brass ball valves.
        - Approved combination test/drain valves may be installed.

- The valves used for the gauge assemblies shall be ¼" globe or angle 3-way valves, with a working pressure of not less than one hundred seventy-five (175) psi. They shall have a screwed bonnet and renewable composition disc

6. Gauges:
    a. Water Pressure:
        - Brass bourdon tube with 3-1/2" diameter case rated for three hundred (300) psi water pressure.
        - Gauge dial: from zero to three hundred (0-300) psi in five (5) pound increments.
        - Equip gauges with a ¼" stem with a ¼" shut-off valve.
    b. Air Pressure:
        - Brass bourdon tube with 3-1/2" diameter case rated for two hundred fifty (250) psi air pressure.
        - Gauge dial: from zero to one hundred (0-100) psi in one (1) psi increments.
        - Equip gauges with a ¼" stem with a ¼" shut-off valve.
7. Hangers And Supports:
    a. Provide pipe hangers of the design required for the specific installation and location.
    b. Install retaining clips/clamps in locations where vibration may be a concern.
    c. The use of toggle bolts for suspension is prohibited.
    d. Suspend piping from structural members only. Support piping from floor or roof slab construction only.
    e. In exposed areas, cut ends of hangers/supports shall be protected with end caps.
    f. In finished ceiling areas, provide plastic buttons/escutcheons where pipe hanger penetrates finished ceiling. Penetrations through finished ceilings must be approved by the District Project Manager.
    g. Powder-actuated supports are prohibited.
8. Metal Cabinet and Attic Stock Spare sprinklers, spare escutcheons, wrenches, and other critical items located where the temperature will not exceed 100 deg F. The number of spare sprinklers shall be based on the requirements of NFPA-13, but a minimum of twenty (20) shall be required.
9. Electrical Equipment shall be compatible with the Fire Alarm and Detection System:
    a. Provide modules for flow and tamper switches. Include all necessary zones for the new fire sprinkler system
        - Supervisory Switches: Compatible with the type of valves used, activated by turning the valve actuator.
        - Shall have automatic reset capabilities.
        - Capable of being wired in normally open/closed position.
        - Cover shall have tamper resistant screws.
        - Minimum contact ratings:

    - 10 A @ 125 VAC
    - 0.25 A @ 24 VDC
  - Tamper Supervisory switches shall initiate a distinct supervisory signal at the Fire Alarm Control Panel (FACP) by zone and/or sub-zone.
- b. Automatic Water Flow Detectors:
  - Electronic vane type or pressure activated.
  - Compatible with the type of pipe and equipment used.
  - Built-in retard device, field adjustable from zero to seventy (0-70) seconds. Set for a time delay of thirty (45) seconds.
    - Exception: pressure switches.
  - Automatic self-reset capabilities.
  - Capable of being wired in normally open position.
  - Tamper-proof.
  - Minimum contact ratings:
    - 5 @ 125 VAC
    - 0.235 A Q 24 VDC
  - All parts in contact with water shall be corrosion resistant.
  - Shall initiate a distinct water flow alarm signal at the Fire Alarm Control Panel (FACP) by zone and/or sub-zone.

10. Fire Department Connections (FDC):
    a. New and existing FDC locations shall be coordinated with the AHJ and the District Project Manager.
    b. Provide wall-mounted Knox-Box adjacent to FDC caps. FDC caps shall be keyed in coordination with the local AHJ.
    c. Provide Horn/Strobe connected to the flow switch at each FDC location.
11. System Drain-down Drainage:
    a. At new construction, install floor drains of adequate capacity to accommodate annual full system flow tests.
       - Minimum 4-inch receptor, including 4-inch P-trap and 4-inch floor sink with cover grate.
    b. At existing construction, evaluate the need for floor drains with the District Project Manager. At a minimum, provide drain-down piped directly to the outside of the building.
    c. Provide drain-down for Fire Department Connection piping
    d. Coordinate all drains with the local AHJ and the District Project Manager.
    e. At system drains terminating at the exterior of the building provide a concrete splash block, culvert, or other means of transporting the system contents to a pervious surface approved by the AHJ and the District Project Manager.
12. Fire Pumps (If required):
    a. The need for a fire pump shall be based on hydraulic calculations.
    b. Provide an electric fire pump to produce adequate pressure for the fire sprinkler system.

c. Coordinate full design scope to include, but not limited to:
    - Wall construction and fire-rated wall/ceiling assemblies, as necessary.
    - Proper room ventilation
    - Coordinate gas and electric service provider regarding new utility requirements.
    - Requirements associated with the demolition of existing equipment such as diesel pumps; including removal of existing fuel tanks, removal of existing fuel, etc.

13. Backflow Preventer:
    a. Prior to the installation of any new backflow preventer, the existing water main shall be thoroughly flushed to prevent potential debris from damaging the new backflow preventer. Provide one (1) backflow repair kit.
14. New Equipment: To the greatest extent possible and in compliance with code, new equipment shall be of the same manufacturer, make, and model as the existing.
15. Unit Prices:
    a. Include the following Unit Prices (Include both Materials and Labor Costs):
        - Sprinkler heads (each)
        - Sprinkler pipe (linear foot)
        - Electrical Devices (each)
        - Specialty Valves (each)
        - Alarm devices (including programming) (each)
        - Graphic annunciator (each)
        - Flow and tamper switches (including break away locks) (each)
        - All building elements and/or devices that may require relocation. (each or linear feet as appropriate)

- Submittals
    1. Design Drawings
    2. Shop Drawings
        a. Full system design.
    3. Product Data
        a. All components.
    4. Test and Inspection Matrix
        a. The Contractor shall be responsible for submitting a testing and inspection matrix prior to beginning construction.
        b. The matrix shall include, at a minimum:
            - All required tests.
            - Parties responsible for performing tests
            - Parties responsible for attending each test/inspection
            - Dates of test/inspection

- Date of notification and parties that will be notified of test/inspection, five (5) business days prior to date of test/inspection

5. Record Drawings
    a. Complete Record Drawings showing as-constructed conditions as identified in the Consultant Guidelines.
6. Test Certificates
    a. Test certificate(s) showing that pneumatic, hydrostatic, and final tests were conducted in accordance with the applicable NFPA standards, shall be submitted to the AHJ and the District Project Manager. Test Certificates shall be included in the Record Closeout Documents.
7. Operating and Maintenance Manual
    a. Complete O & M documents as identified in the Consultant Guidelines.
8. Other
    a. As identified in the Consultant Guidelines.

- Testing Requirements
    a. General Requirements:
        - The Contractor must have adequate personnel on site to perform the required tests and have the Permit Set of drawings available on site at all times.
        - The Contractor shall supply all necessary equipment and tools to successfully perform testing.
    b. District Project Manager and other invited School District personnel and the AHJ shall witness acceptance tests and inspections:
        - A minimum of five (5) working days' notice is required:
            - For cancellation of a test, at least forty eight (48) hours' notice is required or it shall be considered as a re-inspection.
            - Prior to the time of inspection, the Contractor shall verify that all equipment involved in the test are functioning and installed as required by contract documents and shop drawings.
            - Perform final system testing in conjunction with the fire alarm detection system specified in other sections of these Guidelines.
        - Re-inspections:
            - The Contractor shall be responsible for all costs of re-inspection fees incurred by the AHJ.
            - If a system fails any of the above tests, the same scheduling procedure shall be followed.
            - If more than two tests are necessary, Contractor shall be responsible for all re-inspection costs or fees.
        - Acceptance Tests:
            - The Contractor shall conduct the following tests for acceptance of the system installation. This includes all

existing equipment that was re-used in the system. Record the inspections on a copy of Material and Test Certificate, shown in NFPA-13 or similar AHJ-approved forms. Test report information shall be completed by the Contractor prior to each inspection:
    - The Contractor shall perform all tests and inspections with the System Design Engineer, Installer, District Project Manager and the AHJ present. A fire alarm representative shall be present when necessary to test fire alarm devices connected to the sprinkler system.
    - Prior to any tests on sprinkler/standpipe systems, the piping shall be flushed, as required by NFPA-13, to remove any foreign matter that may have entered the system during installation.
    - Functional tests shall be performed on all valves and manual operating devices.
- Specific System Test:
    - For retrofit installations, a pneumatic test with a maximum pressure of forty (40) psi shall be conducted prior to a hydrostatic test to avoid any water damage due to leaks. This test does not replace the hydrostatic test.
- Hydrostatic Test:
    - All piping, including all supply pipes to the Fire Department Connection, shall be hydrostatically tested at fifty (50) psi in excess of the maximum pressure, or two hundred (200) psi, whichever is greater. This test shall be conducted prior to concealing any piping. A complete installation inspection shall be conducted in conjunction with the hydrostatic test while all piping is exposed.
    - If visible signs of leakage occur or the system loses pressure within the two (2) hour test period, the test shall be considered as failed and shall require re-testing after correction of the cause of leakage.
- Final System Inspection:
    - A final inspection shall be performed when the system installation is complete, which includes a complete functional test of all system components and of all alarms via the inspector's test correction. (Manual tripping of alarm devices is not acceptable.)
    - A complete installation inspection shall be conducted by the System Design Engineer and Contractor and District Project Manager and other invited District Staff at the time of the final inspection, which will be coordinated with the work under other sections of these Guidelines.

- A main drain test shall be conducted with the control valve wide open. The main drain valve shall be opened and remain open until the system pressure stabilizes.

- Warranty
    a. All workmanship and materials shall be warranted for a minimum of one year from Acceptance of the completed project. If fire sprinkler installation is a part of a larger scoped project, Acceptance shall be from acceptance of the full project.
    b. Emergency Repair Services
        - During the installation and warranty period, the Contractor shall provide emergency repair service for the sprinkler system within four (4) hours of a request by the District
        - Service shall be available twenty-four (24) hours per day, seven (7) days per week.

END SECTION 21 13 13