1  General
   1.1  Provide all material, labor, engineering and
   operations for the installation of complete and
   operable fire suppression systems as shown in
   the job scope and as specified herein.
   1.2  Provide all equipment and materials
   including pipes, valves, fittings, sprinkler heads,
   fire department connections, backflow preventer,
   pipe supports, specialties and accessories
   necessary for a complete and approved fire
   suppression system.
   1.3  Provide a fire service main from the water
   main into the building, valves, hydrants and
   components as described in the job scope and/or
   shown on the Drawings. Make all connections to
   utilities as required to serve the fire suppression
   system. Flush the fire service main before
   connecting to the fire suppression system.
   1.4  This Contractor shall be completely
   responsible for the design, layout, submittals,
   installation, testing, certification and acceptance
   of the fire suppression system by the IDHS
   Division of Fire and Building Safety.
   1.5  This Contractor shall be responsible for any
   damage to the work of others, to the building and
   to property of others caused by leaks in the fire
   suppression system. This Contractor shall pay for
   necessary replacement of work or damaged
   property during installation and testing period.
   1.6  Apply and pay for all permits and fees
   required for work under this section.

2  Related Requirements
   2.1  Section 28 46 00 Fire Detection and Alarm
   2.2  Basic Mechanical Requirements
   2.3  Basic Materials and Methods

3  Wiring
   3.1  All wiring will be provided under the Fire
   Detection and Alarm Division, unless otherwise
   indicated. The Fire Detection and Alarm Division
   will provide all wiring from workflow switches,
   supervisory switches and alarm bell. Coordinate
   for proper operation. The Fire Detection and
   Alarm Division will provide an alarm bell on the
   exterior of the building.

4  Submittals
   4.1  An action submittal for the fire suppression
   system shall be submitted to the Owner for review
   and approval prior to system installation and shall
   include all of the following:
      4.1.1  Hydraulic calculations and shop
      drawings with riser diagram and system layout
      showing the actual location of all components.
      Obtain approval from the IDHS Division of Fire
      and Building Safety.
      4.1.2  Manufacturer’s product data sheets
      for all equipment and materials including pipes,
      couplings, fittings, valves, sprinkler heads,
      backflow preventers, fire department
      connections, pipe supports, specialties and
      accessories. Indicate which products will be used
      in the project.
      4.2  A closeout submittal for the fire suppression
      system shall be submitted to the Owner after the
      system installation is complete and shall include
      as-built drawings, as-built hydraulic calculations
      and Operation and Maintenance Manuals for the
      fire suppression system. These documents
      should reflect all changes made since the
      approved action submittal.
   4.3  Provide spare parts to the Owner as
   specified
      4.3.1  Provide spare sprinkler heads of
      each type and temperature rating installed on the
      project.
      4.3.2  Provide one sprinkler wrench for
      each type of sprinkler head installed on the
      project.
      4.3.3  Mount sprinkler head cabinets on
      wall next to main riser assembly.
      4.3.4  Provide a list of sprinkler heads
      installed on the project in the sprinkler cabinet.
      4.3.5  Specialty sprinkler heads shall
      include extra escutcheons and cover plates.

5  Quality Assurance
   5.1  Contractor Qualifications
      - Work shall be performed by a contractor
      regularly engaged in the design and
      installation of fire suppression systems.
   5.2  Regulatory Requirements
      5.2.1  System design, installation and
      materials shall comply with the applicable
      regulating agencies and organizations, which
      include, but are not limited to the following:
PHYSICAL FACILITIES
2019 Consultant’s Handbook Specifications
Division 21 Fire Suppression
1000 Water-based Fire Suppression Systems

7.4 Grooves shall be rolled and shall be dimensionally compatible with the coupling. Cut grooves are not acceptable.

7.5 Lightwall pipe is not acceptable.

7.6 Schedule 40

- Black steel pipe, ASTM A135 or A53, joined by welded joints, mechanical grooved couplings, or threaded joints.

7.7 Schedule 10

- Black steel pipe, ASTM A135, joined by welded joints or mechanical grooved couplings.

7.8 The following piping shall be galvanized:

- [Note galvanized pipe on drawings or list areas here:]
- Piping exposed to weather.
- Drain piping open to the atmosphere.
- Piping used in a corrosive atmosphere (where noted on the Drawings).
- Piping inside the building upstream of the backflow preventer shall be schedule 40 galvanized only.
- Existing dry and preaction systems that do not have dry pipe nitrogen inerting.

8 Fittings

8.1 Plain end, pressure fit type fittings are not acceptable.

8.2 Hole cut mechanical tee fittings are not acceptable.

8.3 Galvanized piping shall have galvanized fittings.

8.4 1½” pipe and smaller shall have threaded fittings.

8.5 Threaded

8.5.1 Cast iron in accordance with ASME B16.4 Class 125 or 250.

8.5.2 Malleable iron in accordance with ASME B16.3 Class 150 or 300.

8.6 Flanged

8.6.1 Cast iron in accordance with ASME B16.1 Class 125 or 250.

8.6.2 Gaskets shall be full face of 1/8” minimum thickness, red sheet rubber.

8.6.3 Flange bolts shall be hexagon head machine bolts with heavy semi-flushed hexagon head nuts, cadmium plated, with dimensions in accordance with ASME B18.2.

8.7 Welded
8.7.1 Standard weight, black steel in accordance with applicable ASME and ASTM standards.

8.7.2 The branch fitting diameter shall not exceed half of the nominal pipe size.

8.8 Grooved

8.8.1 Couplings and fittings shall be ductile iron conforming to ASTM A536, minimum 350 psi rated pressure. 5", 6", and 8" couplings shall be a minimum of 300 psi rated pressure.

8.8.2 Short pattern fittings shall be full-flow with flow characteristics similar to standard pattern full-flow fittings.

8.8.3 Couplings shall be rigid type. Flexible type couplings shall be used in locations where vibration attenuation and stress relief are required.

8.9 Braided Flexible Hose

8.9.1 Braided flexible hose fittings shall be either FlexHead or VicFlex.

8.9.2 Braided flexible hose fittings shall only be installed with manufacturer approved brackets.

9 Valves

9.1 General

● All valve sizes shall be compatible with the pipe size.

9.2 Gate Valves

9.2.1 1½" pipe and smaller: OS&Y, bronze, threaded.

9.2.2 2" pipe and larger: OS&Y, resilient-seated, iron body, bronze mounted, flanged or grooved.

9.3 Butterfly Valves

9.3.1 Iron body (lug-style or grooved end), minimum 300 PSI rated pressure, and gear operator with position indicator.

9.4 Check Valves

9.4.1 1½" pipe and smaller: bronze, threaded.

9.4.2 2" pipe and larger: Class 150 or 300, center guided, non-slam type, ductile iron body, stainless steel spring, flanged or grooved.

9.5 Relief Valves

● Relief valves shall not be less than ½" in size and set to operate at 175 PSI or 10 PSI in excess of the maximum system pressure, whichever is greater.

10 Sprinkler Heads

10.1 Temperature Ratings

10.1.1 Ordinary temperature, except where higher temperature sprinkler heads are required.

10.1.2 Sprinkler heads shall be color coded.

10.1.3 Sprinkler heads located in rooms with electrical switchgear shall be 212° F.

10.2 Sprinkler heads in finished ceilings shall be [white] finish [recessed] pendent type with adjustable two piece escutcheons, unless otherwise noted.

10.3 Sprinkler heads in rooms without finished ceilings and unfinished spaces shall be [plain brass] pendent or upright as required.

10.4 Pendent and horizontal sprinkler heads in areas subject to freezing shall be dry type (walk-in coolers/freezers, cold rooms, loading docks).

10.5 Pendent and horizontal sprinkler heads on dry and preaction systems shall be of the dry type only.

10.6 Horizontal sidewall sprinklers shall be [chrome] finish with [chrome] escutcheons. Horizontal sidewall sprinklers shall be used where shown on the Drawings [and shall include the following areas]:

10.7 Window sprinklers shall be quick response, horizontal sidewall or pendant vertical sidewall with [chrome] finish and [chrome] escutcheons. Tyco Model WS or approved equal.

11 Backflow Preventers

11.1 Indiana Department of Environmental Management approved, ASSE listed and USC approved.

11.2 Double Check Valve Assembly [If the water utility is from Purdue – West Lafayette]
Double check valve assembly shall be a Watts Series LF709, Febco LF850, or approved equal.

Double Check Detector Assembly [If the water utility isn’t from Purdue – West Lafayette]

Double check detector assembly shall be a Febco LF856 or approved equal.

12 Fire Department Connections
12.1 General


12.1.2 [Indiana University Purdue University Fort Wayne (IFPW) Only]: Fire department connections shall be listed, 5” Storz, 30 degree elbow adapter, with heavy and blind cap.

12.1.3 [Wall] [Base] plates shall have 1” letters and read ["AUTO SPKR"] ["STANDPIPE"] ["DRY STANDPIPE"] ["AUTO SPKR AND STANDPIPE"].

12.2 Wall type shall be [flush] [exposed] with a [polished brass] [polished chrome plated] finish.

12.3 Freestanding type shall have cast brass body with [polished brass] [rough brass] [polished chrome plated] finish. [Polished brass] [Polished chrome plated] trim and seamless cover sleeve. Cast brass base plate.

13 Hose Connections
13.1 Non-adjustable pressure regulating angle valve (where pressure is 100 PSI or higher)

13.1.1 1½” hose thread outlet, UL listed, cast brass, 300 PSI rated, brass finish with cap and chain. Potter Roemer 4045 or approved equal.

13.1.2 2½” hose thread outlet, UL listed, cast brass, 300 PSI rated, brass finish with cap and chain. Potter Roemer 4053 or approved equal.

13.2 Angle hose valve (where pressure is less than 100 PSI)

13.2.1 1½”, UL listed and FM approved, cast brass, 300 PSI rated, hose thread outlet, polished brass finish with cap and chain. Potter Roemer 4060 or approved equal.

13.2.2 2½”, UL listed and FM approved, cast brass, 300 PSI rated, hose thread outlet, polished brass finish with cap and chain. Potter Roemer 4065 or approved equal.

13.3 Hose Valve Cabinets: 20 gauge steel, 18” x 18” x 8” valve cabinet with [full glass with tempered safety glass] [flush solid metal] door, prime coat finish, 18 gauge frame, continuous steel hinge. Cabinet shall be [surface mounted] [fully recessed] and contain 2½” angle hose valve with cap and chain. Provide "Fire Department Valve" decal. Potter Roemer 1810 Series or approved equal.

13.4 Combination Hose Valve/Fire Extinguisher Cabinets: 20 gauge steel, 18” W x 24”H x 8”D valve and extinguisher cabinet with [ duo-panel with tempered safety glass] [flush solid metal] door, prime coat finish, 18 gauge frame, continuous steel hinge. Cabinet shall be [surface mounted] [fully recessed] and contain 2½” angle hose valve with cap and chain and fire extinguisher. Provide "Fire Department Valve" and "Fire Extinguisher" decals. Potter Roemer Series 1880 or approved equal.

13.5 Roof Hose Valves

13.5.1 Provide remote gate valve located in a heated area. Provide automatic ball drip on downstream side of valve and pipe to closest discharge point. Roof manifolds shall be listed, [2] [3] way with 2½” outlets x [4] [6]” inlet, complete with hose valves, caps and chains. Outlet shall be made freeze proof by connection to above mentioned valve system.

13.5.2 [Floor Type]: provided with an indication floor stand with extension stem and stem to valve coupling.

13.5.3 [Wall Type]: provided with a wall type indicator post with extension rod, coupling and extension barrel.

14 Dry Pipe Valve Assemblies
14.1 Provide a complete dry pipe valve assembly with accessories and trim package including but not limited to drain valves, check valves, test valve, alarm pressure switch, low-air supervisory switch, drain cup, reset bar and pressure gauges. Provide accelerator as required. Viking or approved equal.

15 Deluge Valve Assemblies
15.1 Provide a complete deluge valve assembly
with accessories and trim package including but not limited to emergency release, pressure operated relief valve, drain valves, check valves, test valve, drain cup, pressure gauges. System shall have [hydraulic release] [electric actuation] [pneumatic actuation]. Viking [model e-1] [model e-2] or approved equal.

16 Preaction Valve Assemblies

16.1 Double interlock, supervised, dry system with deluge valve controlled by an electric release system and pneumatic system pressure. The electric detector system must actuate and a sprinkler must operate before water will enter the system. Activation of one without the other shall only sound an alarm. System shall include all valves, trim, accessories and components to provide a complete assembly. System shall be of a fail-safe design on loss of power. Viking Surefire or approved equal.

16.2 Release control panel shall be Viking VFR-400.

16.3 Deluge Valve and Trim
- Deluge Valve.
- Test drain valve.
- Auxiliary drain valve.
- Drain cup.
- Drip check.
- Alarm test shut-off valve.
- Strainer orifice check valve.
- Pressure operated relief valve.
- Priming valve.
- Emergency release. Ball valve with stainless steel enclosure.
- Priming pressure gauge and valve.
- Water supply pressure gauge and valve.

16.4 Water Flow Alarm Trim
- Alarm pressure switch.

16.5 Riser Valves
- Water supply control valve.
- Rubber seat check valve.
- Main system drain valve.

16.6 System Air/Nitrogen Supply Trim
- System pressure gauge and valve.
- Soft seat check valve.
- Air pressure supervisory switch.
- Air maintenance control device.

16.7 Air supply control valve

16.7.1 Release Trim

16.8 Pneumatic actuator.

17 Corrosion Prevention

17.1 Wet Pipe Nitrogen Inerting:
- 17.1.1 Nitrogen inerting vents and injection ports shall be ECS PAV-WN or approved equal.
- 17.1.2 Wet pipe nitrogen inerting procedure components shall be ECS NISK-1 or approved equal.
- 17.1.3 Handheld gas analyzer shall be ECS PHGA-1.

17.2 Dry Pipe Nitrogen Inerting (Dry and Preaction Systems):
- 17.2.1 Nitrogen generator shall be ECS PGEN or approved equal.
- 17.2.2 Air maintenance devices shall be Victaulic 757, Tyco AMD-1, or Reliable A-2.
- 17.2.3 Dry vent shall be ECS PAV-D or approved equal.

17.3 Corrosion monitoring station shall be ECS ICMS and probe with push button test ECS DCMP-3 or approved equal.

18 Fire Alarm Devices

18.1 Waterflow switches shall be vane type with field replaceable instantly recycling adjustable pneumatic retard and visual indication of activation. Potter VSR or approved equal.

18.2 Valve Supervisory Switches — Die cast enclosure with red enamel finish and tamper resistant screws. Two sets of contacts. Mounting device shall be weatherproof and suitable for indoor or outdoor use. Potter or approved equal.
- Post-Indicator Valves: Potter PCVS-2.

19 Examination

19.1 Verification of Conditions
- 19.1.1 Examination shall be done before design approval and fabrication. Prefabrication is done at This Contractor’s risk.
- 19.1.2 Examine the project site and become familiar with the actual job conditions under which the work will be performed.
- 19.1.3 Coordinate all work and placement of components with other trades.
19.1.4 Verify all dimensions. Be responsible for all measurements, fitting and assembly of all work.
19.1.5 Modify design as required to integrate with actual job conditions, coordination and dimensions.
19.1.6 This Contractor shall be responsible for any redesign and refabricating.

20 Preparation
20.1 The action submittal for the fire suppression system must be approved before work may begin.
20.2 Inspect pipe and fittings for defects and clean all dirt and other foreign matter prior to installation. Damaged pipe and fittings will be rejected.

21 Installation
21.1 General
21.1.1 Contractor shall make all connections to utilities as required to install the system. All connections to utilities and their shutdown shall be arranged with the Owner.
21.1.2 The sprinkler system shall be zoned on a floor-by-floor basis. In addition, systems protecting special hazards shall be zoned separately.
21.1.3 Install chrome plated and other finished components with care so that marring does not occur to the finish.
21.2 Pipe
21.2.1 The Drawings indicate general intent and location. Install piping in the most direct and straight manner as possible.
21.2.2 Install piping high enough to permit relocation of lights without moving ceiling grid.
21.2.3 Conceal piping in finished areas unless otherwise shown on the Drawings.
21.2.4 Install vertical lines plumb and horizontal lines parallel to building lines.
21.2.5 Install horizontal piping pitched to low points and in a manner to make it possible to test and empty entire system. Provide valves at low points to facilitate system drainage.
21.2.6 Protect open pipe ends whenever work is suspended during construction to prevent foreign material from entering.
21.2.7 Protect piping that passes through non-sprinkler areas with fire resistive construction as required by code and approved by the Owner.
21.2.8 This Contractor shall sterilize all piping upstream of fire sprinkler system backflow preventer.
21.3 Pipe Hangers and Supports — Support piping from the structure above with hangers. Sizing, spacing and installation shall be in accordance with NFPA 13, unless otherwise shown on the Drawings or specified herein. Comply with other sections of this specification relating to Basic Mechanical Materials and Methods.
21.3.1 Seismic Performance [New Buildings with a Seismic Design Category “C” or higher]
- System piping shall be capable of withstanding the effects of earthquake motions determined in accordance with the Indiana Building Code and NFPA 13.
- [Some existing facilities require seismic bracing.]
21.4 Pipe Sleeves
21.4.1 Provide sleeves for pipes passing through building walls and floors above grade.
21.4.2 The annular spaces between pipe and sleeves shall be sealed with caulking or shall be fire stopped where required.
21.4.3 Provide chrome plated escutcheons large enough to cover the pipe sleeve in finished areas.
21.5 Sprinkler Heads
21.5.1 Install sprinkler heads in accordance with the manufacturer’s instructions. Heads shall be installed to satisfy all code requirements for head spacing.
21.5.2 Center sprinkler heads in grid or lay-in ceilings in both directions.
- Exception: In rooms with an area of 150 sq. ft. or less, sprinkler heads may be centered in the grid or tile in one direction only.
21.5.3 Coordinate location of sprinkler heads with ceiling grid, diffusers, light fixtures and other obstructions. Provide additional sprinkler heads which may be required for coordinated ceiling pattern and for centering, even though it may exceed minimum code requirements. Show actual sprinkler head locations in the action submittal and closeout submittal.
21.5.4 Provide sprinkler head guards on heads below 7’6’’ above the floor or walkway or where sprinkler heads may be exposed or subject to damage.
21.5.5 Protect finishes against scratches, dents and discoloration. Defective items will not be accepted.

21.5.6 Only new sprinklers shall be installed. When a sprinkler head has been removed from the piping for any reason, it shall not be reinstalled. Install a new sprinkler head that matches the specifications of other sprinkler heads in the same compartment.

21.5.7 Sprinkler head locations shown on the Drawings are for general intent only. This Contractor is responsible for a system layout in accordance with code requirements and Owner specification.

21.6 Main Riser and/or Header Assembly — Provide main riser or header assembly consisting of a backflow preventer, fire department connection, drain valve, pressure gauge, main waterflow switch, and [corrosion monitoring station].

21.7 Backflow Preventers

21.7.1 Install in compliance with state regulations. Mount horizontal, maximum 4 ft. above the floor.

21.7.2 Complete full flow backflow preventer test to ensure proper operation. Inspection shall be performed by a registered inspector in accordance with the Indiana Department of Environmental Management. Submit reports to the Owner and include a copy in the Operation and Maintenance manuals.

21.8 Fire Department Connections — Provide a check valve with ball drip valve in line connecting fire department connection to fire suppression system.

21.9 Inspector’s Test Connections

21.10 Inspector’s test connections shall be installed at the most remote point of each sprinkler system zone. Test connections shall be provided with a 1” pipe and valve. Test pipe shall discharge to the outside through a corrosion resistant orifice of the proper size, where it can easily be seen. Location of discharge shall be as approved by the Owner.

21.11 Sectional Control Assembly — Provide sectional control assembly for each sprinkler zone. Sectional control assembly shall include supervised shut off valve, [check valve], pressure gauge, water flow indicator, test valve, drain valve, sight glass, and restricted orifice union of the proper size.

21.12 Drains — Pipe drains to terminate at floor drains or outside the building as shown on the Drawings or as specified. Location of drains to the building exterior shall be approved by the Owner.

21.13 Ball Drip Valves — Locate ball drips in accessible locations and pipe discharge full size to nearest floor drain.

21.14 Fire Alarm Devices — Provide a waterflow switch for each sprinkler zone. Provide a redundant hardwired main waterflow switch upstream of all of the sprinkler zones.

21.15 Valve Supervisory Switches — Provide valve supervisory switches for all water supply shut-off valves.

22 Corrosion Prevention Installation

22.1 Wet Pipe Nitrogen Inerting

22.1.1 Provide nitrogen inerting vents at an accessible, remote high point of each sprinkler zone where the pressure gauge is visible from below. The location of the vents shall be proposed in the action submittal and approved by the Owner.

22.1.2 Provide nitrogen inerting vents at the top of each standpipe or combination riser.

22.1.3 Provide nitrogen injection ports for each nitrogen inerting vent at the riser on system side of the sectional control assembly.

22.1.4 Provide wet pipe nitrogen inerting procedure components which includes a 3/8” rubber hose, a nitrogen cylinder regulator, and brass couplers for quick connection.

22.1.5 Provide handheld gas analyzer to sample the gas concentration during the wet pipe nitrogen inerting procedure.

22.1.6 Provide nitrogen to fully inert all wet pipe sprinkler zones and standpipe or combination risers in accordance with the manufacturer’s wet pipe nitrogen inerting procedure.

22.2 Dry Pipe Nitrogen Inerting

22.2.1 Provide a nitrogen generation system to serve dry and preaction sprinkler systems.

22.2.2 Provide a manual dry vent for each dry/preaction sprinkler system on the system side of the valve.

22.2.3 Provide a separate air compressor if the nitrogen generation system does not meet fast fill requirements. Install tank mounted air compressors on neoprene vibration isolation pads Kinetics Model NGD and 4” concrete pad.
22.3 Corrosion Monitoring Station
   22.3.1 Provide corrosion monitoring station on the main sprinkler riser downstream of the double check valve, in an accessible location and in accordance with manufacturer’s instructions. Complete the manufacturer’s procedure to place the corrosion monitoring station in service.
   22.3.2 Provide probe with push button test for visual indication of corrosion activity.

23 Wet Pipe Sprinkler Systems
23.1 General
   23.1.1 Fire sprinklers shall be provided for the [entire building.] [project area.]
   23.1.2 The following sprinkler zones shall be provided:
   23.1.3 Do not install sprinkler piping or sprinkler heads in elevator shafts or elevator equipment rooms.
   23.1.4 Do not install sprinkler heads in transformer vault.
   23.1.5 Provide sprinkler heads at all stair landings, except intermediate landings.

23.2 Design Criteria:— The system shall be hydraulically calculated to provide [0.XX] GPM/ft² over the most hydraulically remote [X,XXX] ft², including [XXX] GPM hose allowance. Sprinklers shall have a maximum coverage area of [XXX] ft² per head. The design area of operation shall not be decreased, even when allowed by NFPA 13.

23.3 [Paint Spray:] — Provide sprinkler heads in finishing room and for paint spray booth and related exhaust ductwork in accordance with NFPA 33. Maximum 12 ft. sprinkler spacing in ductwork. Use dry type sprinkler heads in ductwork as required. All sprinklers shall be controlled by an accessible and supervised OS&Y sectional control valve.

24 Dry Pipe Sprinkler Systems
24.1 General
   24.1.1 [Provide dry pipe sprinkler systems for:]
   24.1.2 Provide a nitrogen/air supply line from the nitrogen generation system. Provide air maintenance device and check valve at connection to the trim work.

24.2 Design Criteria:
   24.2.1 The system shall be hydraulically calculated to provide [0.XX] GPM/ft² over the most hydraulically remote [X,XXX] ft², including [XXX] GPM hose allowance. Sprinklers shall have a maximum coverage area of [XXX] ft² per head. The design area of operation shall not be decreased, even when allowed by NFPA 13.

25 Preaction Sprinkler Systems
25.1 General
   25.1.1 [Provide double interlocked preaction system for:]
   25.1.2 Provide a nitrogen/air supply line from the nitrogen generation system. Provide air maintenance device and check valve at connection to the trim work.
   25.1.3 Emergency release shall be provided at deluge valve. An additional release shall be located in [choose location]. Pipe drain to floor drain located in [choose location].
   25.1.4 This Contractor shall provide a completely pre-assembled, pre-wired fire protection valve system that includes trim piping and a release panel. The Electrical Contractor shall be responsible for programming the release panel, setting pressure switch trip points, verifying the proper operation of the preaction system controlled by the releasing panel, and connecting the release panel to the fire alarm system. The Electrical Contractor will provide system initiating devices and will terminate associated wiring. Coordinate for proper operation.

25.2 Design Criteria:
   25.2.1 The system shall be hydraulically calculated to provide [0.XX] GPM/ft² over the most hydraulically remote [X,XXX] ft², including [XXX] GPM hose allowance. Sprinklers shall have a maximum coverage area of [XXX] ft² per head. The design area of operation shall not be decreased, even when allowed by NFPA 13.

26 Hydraulic Calculations
26.1 General
   26.1.1 This Contractor shall prepare hydraulic calculations for the design of the system and submit to the Owner and IDHS Division of Fire and Building Safety for approval before any fabrication or installation is started.
   26.1.2 Hydraulic calculations shall include the volume in gallons of all systems installed.

26.2 Flow Test Data: [If the water utility is from
26.2.1 This flow test data shall be used in the design of the system: Static pressure of [XX] PSI, with a residual pressure of [XX] PSI flowing [X,XXX] GPM.

26.3 Flow Test Data: [If the water utility isn’t from Purdue – West Lafayette]

26.3.1 Flow tests shall be performed by This Contractor and verified by local fire department. Make all arrangements and pay for all costs involved.

The static pressure shall be adjusted to 85%. The residual pressure shall be adjusted by same fixed value as the static pressure. This adjustment does not change the slope of the water supply curve.

27 Standpipe Systems

27.1 Provide a [Class I] [Class II] [Class III], [automatic-dry] [semiautomatic-dry] [manual-dry] [automatic-wet] [semiautomatic-wet] [manual-wet] standpipe in each stairway in accordance with NFPA 14. The system shall be [pipe sized] [hydraulically designed to provide the required minimum pressure and flow rate].

27.2 Provide a 2½” hose valve, 4 ft. above the floor, at the following locations:

- At each intermediate landing between floor levels in every required stairway.
- At the highest landing of stairways with stairway access to the roof.

27.3 At each standpipe where stairway does not access the roof, provide a roof manifold when the roof has a slope of less than 4" in 12". Where lines pass through the roof, provide flashing and counterflashing as required for a watertight installation. Roof manifold is not required if stairway goes to roof.

27.4 All standpipes shall be interconnected at the bottom. Provide isolation valve for all risers.

27.5 Provide drain valves with hose connection at the low point of all standpipes downstream of the isolation valve.

27.6 Provide a ¾” water connection with shut-off valve and check valve for maintaining water within a manual-wet system. Water supply connection shall be made downstream of backflow preventer.

27.7 Provide sign at each hose connection for manual standpipes that reads "MANUAL STANDPIPE FOR FIRE DEPARTMENT USE ONLY".

28 Existing Construction

28.1 Provide all work necessary to accommodate additions and alterations as required to meet code requirements and this Specification.

28.2 Modify the fire suppression system to accommodate renovations that affect sprinkler spacing or coverage. Relocate existing piping or provide additional sprinkler heads and piping to accommodate new work.

28.3 Only new sprinklers shall be installed. When a sprinkler head or piping with sprinkler head attached has been removed for any reason, it shall not be reinstalled. Install a new sprinkler head that matches the specifications of other sprinkler heads in the same compartment.

28.4 Piping and sprinkler heads shown on the Drawings and old record drawings are for general information and reference only. This Contractor shall examine the project site for verification.

28.5 Existing fire suppression systems can be shut down and drained by the Owner after the action submittal is approved. Plan work so that the interruption is minimized. Provide temporary caps to isolate piping to areas where work is being performed.

29 Identification

29.1 Identify piping installed in this project, exposed or concealed, with a label.

29.2 Piping shall be labeled close to valves, at changes in direction, at branches, at access panels, before pipes pass through the floor and at entry point into rooms; however, spacing of labels shall not exceed 20 ft. Labels shall be in contrasting colors such as black on white placed in conspicuous location subject to approval by the Owner.

29.3 The label shall consist of an arrow, approximately 6” in length with the width to be determined by letter height, and an abbreviation of the service ("FL" for Fireline). The following letter sizes shall apply:

- Pipe under 1” diameter: Letter Size ½"
- Pipe 1” to 3” diameter: Letter Size 1"
- Pipe over 3” diameter: Letter Size 2"
30 Painting

30.1 All exposed fire suppression piping shall be painted. Except in mechanical, general storage and utility areas, paint shall match interior finish or as specified by Owner. Mechanical, general storage and utility shall be painted red equal to Glidden #4520 or Rustoleum #964.

31 Closeout Activities

31.1 Testing and Acceptance

31.1.1 Perform all operational and acceptance tests required by NFPA 13 and 14. All tests shall be made in the presence of the Owner's representative.

31.1.2 Test all piping hydrostatically at not less than 200 PSI for 2 hours without loss of pressure. Retest piping that fails initial tests after correction of defective work.

31.1.3 Schedule a final acceptance test with Owner at least seven days in advance.

31.1.4 Complete and sign Contractor's Material and Test Certificates. Pay for all inspections by the authority having jurisdiction and obtain approval of the installation. Include copies of the certificates in the Operations and Maintenance Manuals.

31.2 Demonstration

31.2.1 When required approvals of this work have been obtained, schedule to demonstrate to the Owner's fire equipment personnel the operation and maintenance of the systems.

31.2.2 Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

31.3 Corrosion Prevention Procedures

31.3.1 Complete the manufacturer's wet pipe nitrogen inerting procedure for all wet pipe fire suppression zones. Each zone shall have at least 98% nitrogen after the final cycle.

31.3.2 Complete the procedure to place the corrosion monitoring station in service.