SECTION 21 1313

WET PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 REFERENCES

A. The publications listed below form a part of this specification section to the extent referenced. The publications are referred to within the text by the basic designation only. Use the latest edition, unless noted otherwise.

B. ASME INTERNATIONAL (ASME)
   1. ASME B16.1 Gray Iron Pipe Flanges and Flanged Fittings; Classes 25, 125 and 250
   2. ASME B16.3 Malleable Iron Threaded Fittings, Classes 150 and 300
   3. ASME B16.4 Gray Iron Threaded Fittings; Classes 125 and 250

C. AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
   1. ASSE 1013 Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers
   2. ASSE 1015 Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies

D. ASTM INTERNATIONAL (ASTM)
   2. ASTM A183 Standard Specification for Carbon Steel Track Bolts and Nuts
   4. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   5. ASTM A536 Standard Specification for Ductile Iron Castings

E. AMERICAN WATER WORKS ASSOCIATION (AWWA)
   1. AWWA M14 Backflow Prevention and Cross-Connection Control: Recommended Practices
   2. AWWA C203 Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape – Hot Applied
   4. AWWA C104/A21.4 American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

F. FM GLOBAL (FM)
G. INTERNATIONAL CODE COUNCIL


H. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

1. MSS SP-71 Gray Iron Swing Check Valves, Flanged and Threaded Ends

I. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)


J. SRP Codes

1. SRP AFC SRP Administrative Fire Code

K. UNDERWRITERS LABORATORIES (UL)

1. UL 668 Hose Valves for Fire Protection Service
2. UL 405 Fire Department Connection Devices
3. UL 213 Standard for Rubber Gasketed Fittings for Fire-Protection Service
4. UL 262 Standard for Gate Valves for Fire-Protection Service
5. UL 393 Standard for Indicating Pressure Gauges for Fire-Protection Service
6. UL 789 Standard for Indicator Posts for Fire-Protection Service

1.2 NOTICE TO BIDDERS

A. Before submittal of bid, examine all drawings, specification, addenda, alternatives, special conditions, and all other bidding documents of all sections of this project, verifying all governing conditions at the site, and become fully informed as to the extent and character of the work required, as well as its relation to other work in the building. Submittal of a bid is an agreement to all requirements of the contract documents and no consideration will be granted for any claimed misunderstanding thereof.

B. Submittal of a bid is deemed a representation by the bidder that he is qualified in all respects to properly perform the work for which he is bidding and has experience with similar work. Bidders are deemed to be aware, on the basis of their background and experience, of materials which may be required in the discharge of their responsibilities, even though unspecified.

C. Any case of error, omission, discrepancy, inconsistency or lack of clarity in the specification or drawings shall be promptly identified to SRP.

1.3 DESCRIPTION OF WORK

A. A wet pipe sprinkler system shall be provided in areas indicated on the drawings. The sprinkler system shall provide fire sprinkler protection for the entire building. Except as modified herein, the system shall be designed and installed in accordance with NFPA 13. Pipe sizes which are not indicated on drawings shall be determined by hydraulic calculation. The contractor shall design any
portions of the sprinkler system that are not indicated on the drawings or specified herein, including locating and sizing sprinklers, piping and equipment. The design of the sprinkler system shall be based on hydraulic calculations, and the other provisions specified herein.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical. Deviations from approved working plans for piping require written approval from SRP.

C. Hydraulic Design: The system shall be hydraulically designed to discharge a minimum density as indicated on the drawings. Hydraulic calculations shall be in accordance with NFPA 13. A 10-pound per square inch safety margin shall be provided at the point of connection to the city water main.

D. Basis for Calculations: A water flow test was performed on (DATE) at (LOCATION) and resulted in a static pressure of ___ psi with a residual pressure of ___ psi while flowing ____ gpm. The fire sprinkler subcontractor shall perform a fire hydrant flow test prior to shop drawings submittal. The results shall be included with the hydraulic calculations. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for steel piping and 150 for underground plastic piping.

E. Sprinkler Coverage: Sprinklers shall be uniformly spaced on branch lines. Sprinklers shall provide coverage throughout 100 percent of the building. Coverage per sprinkler shall be in accordance with NFPA 13. Provide sprinklers below all ducts over 4'-0" wide; coordinate with HVAC drawings.

1. The Small Room Rule shall NOT apply in SRP facilities.

1.4 SUBMITTALS

A. Submit six copies of the following, no later than 21 days prior to the start of system installation, in accordance with the General Conditions of the Contract. Drawings, unless noted otherwise, shall be no smaller than the Contract Drawings.

1. Shop Drawings: Detail drawings conforming to the requirements prescribed in NFPA 13 and NFPA 170. Drawings shall include plan and elevation views which establish that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:
   a. A descriptive index with drawings listed in sequence by number. A legend sheet identifying device symbols, nomenclature, and conventions used in the package.
   b. Floor plans drawn to a scale not less than 1/8-inch equals 1-foot clearly showing locations of devices, equipment, risers, electrical power connections and other details required to clearly describe the proposed arrangement.
   c. Riser layout drawings drawn to a scale of not less than 1/2-inch equals 1-foot to show details of each system component, clearances between each other and from other equipment and construction in the room.
   d. Details of each type of pipe hanger and related components.
   e. Shop drawings and calculations shall be prepared by a qualified NICET Level III (or IB) Technician.

The Contractor shall not order any equipment and shall not begin any work until the submittals have been approved in writing by SRP. The contractor shall not perform any installation prior to the receipt of a written authority to proceed from SRP. If submittals are found not to conform to all of the requirements of this specification section and the applicable referenced Codes, Standards and Regulations, the contractor shall be required to revise and resubmit the package with modifications.
2. Hydraulic calculations shall be as outlined in NFPA 13 except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings. Calculations shall be based on the water supply data provided in the specification section. Calculations shall substantiate that the design area used in the calculations is the most demanding hydraulically. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. A summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows shall be provided. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. The diameter, length, flow, velocity, friction loss, number and type of fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient shall be indicated for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used.

3. Product Data: Annotated catalog data showing manufacturer's name, model, and catalog number for all equipment and components, with data highlighted to indicate model, size, options, etc. proposed for installation. In addition, a complete equipment list with equipment description, model number, and quantity shall be provided. This shall include the following:
   a. Pipe, fittings, and mechanical couplings
   b. Valves, including gate, check, and globe
   c. Pipe hangers and supports
   d. Water flow and tamper switches
   e. Sprinklers
   f. Fire department connection
   g. Backflow prevention devices
   h. Fire hose valve
   i. Miscellaneous equipment (such as spare sprinkler cabinet, signs, etc.)

4. Installers Qualifications: Data approved, prior to submittal of any other data or drawings, to substantiate that the proposed installer is regularly engaged in the installation of the type and complexity of the fire protection system included in this project. Data shall identify the location of three systems recently installed by the proposed installer which are comparable to the system specified. Contractor shall certify that each system has performed satisfactorily, in the manner intended, for a period of not less than 6 months. Submit copy of license to perform work in the local jurisdiction and submit certification for the personnel working on the project as detailed in 1.5 Quality Assurance.


6. As-Built Drawings: In addition to six hard copies, furnish one set of CD or DVD discs containing software back-up and CAD based drawings in the latest version of AutoCAD and DXF format and pdf copy of as-built drawings and schematics. A separate set of approved submittal drawings of the overall system, marked-up to indicate as-built conditions, shall be maintained on site. These drawings shall be maintained in a current condition at all times, and shall be made available for review immediately upon request during normal working hours. Variations from approved drawings, for whatever reason, including those occasioned by modifications, change orders, optional materials, and/or required for coordination between trades shall be indicated in sufficient detail to accurately reflect the as-built conditions. These drawings shall be submitted within 14 calendar days after the final acceptance test of the system. At least two sets of as-built (marked-up) drawings shall be provided to SRP at the time of, or prior to the final acceptance test.
7. Operation and Maintenance Data: Six manuals in loose-leaf binder format and grouped by technical sections consisting of manufacturer’s brochures, schematics, printed instructions, general operating procedures, and safety precautions. Manuals shall be submitted and approved prior to on-site training. In addition to items specified in Division 01 Section 017823 “Operation and Maintenance Data”, the Manual shall include the following documents and information at a minimum:
   a. A general description of the design and operation of the system(s)
   b. Specific open/close settings for all adjustable valves.
   c. Comply with the "Records" Section of NFPA 25.
   d. A copy of the as-built design drawings in 11 x 17-inch format, folded neatly within the binder.
   e. All applicable product installation sheets annotated as necessary.
   f. Step-by-step procedures required for system startup, operation, and shutdown, including the sequence or sequences of operation of the overall fire protection system and a separate description for each major subsystem.
   g. The manufacturer’s name, model number, service manual, parts list, and complete description of equipment and their basic operating features.
   h. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, troubleshooting guide, and system warranty information.
   i. Routine maintenance checklist. The routine maintenance checklist shall be arranged in columnar format. The first column shall list all installed devices, the second column shall state the maintenance activity or state no maintenance required, the third column shall state the frequency of the maintenance activity, and the fourth column for additional comments or reference.

8. Impairment Plan: In the event the scope of work may remove from service or interfere with a fire suppression or alarm system, the design engineer shall consult and communicate with the SRP Fire Marshal to develop an Impairment Plan. The Impairment Plan developed by the design engineer shall be submitted at the same time as the design drawings for review and approval. The final plan shall be written on the drawings.

9. Training Documentation: Provide in manual format, lesson plans, operating instructions, maintenance procedures, and training data for the training courses. The operations training shall familiarize SRP’s designated personnel with proper operation of the installed system. The maintenance training course shall provide SRP’s designated personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

10. Schedule: Provide a schedule indicating the delivery dates of the equipment to be supplied; installation sequence; time frame and the total amount of on-site technical assistance time (in man-hours per phase) that the supplier of the equipment has included in their bid to comply with the requirements of this specification section and SRP’s requirements; and final acceptance test dates to meet SRP’s scheduled project completion dates.

11. In the event that the Contractor’s submittal package is required to be revised and resubmitted due to nonconformance with this specification, illegibility of the submittal, incomplete submittals, noncompliance with the referenced local, state and national Codes, Standards and Regulations or nonconformance with pertinent documentation relative to the project, the contractor shall pay all fees associated with the additional submittal review. Payment of the fee shall be solely the contractor’s responsibility.
1.5 QUALITY ASSURANCE

A. The recommended practices stated in the manufacturer's literature or documentation shall be considered as mandatory requirements.

B. Qualifications - Contractor: The contractor shall be an Arizona licensed contractor in possession of a valid fire sprinkler contractor’s license. Design and installation must be performed by a sprinkler contractor whose business is located within a 75-mile radius of the project site. The contractor shall have a minimum of 3 years of experience in the installation of automatic sprinkler systems in similar facilities.

C. Qualification - Design Services: Shop (working) drawings and calculations shall be prepared under the direction of and signed by a qualified registered Professional Engineer or a NICET Level III (minimum) in water-based systems. For the purposes of meeting this requirement, a qualified engineer is defined as an individual meeting one of the following conditions:

1. A registered professional engineer having passed the NCEES examination in fire protection engineering.

2. Registered professional engineer with verification of experience and at least 5 years of current experience in the design of the fire protection and detection systems.

D. Qualifications - Supervisor: A NICET Level III (minimum) in water-based systems shall supervise the installation of the fire sprinkler system.

E. Qualifications - Installer: Fire sprinkler installers with a minimum of 2 years of experience or who possess a CSA certification shall be permitted to assist in the installation of the fire sprinkler system.

F. Qualifications - Test Personnel: Fire sprinkler technicians with a minimum of 8 years of experience shall be utilized to test and certify the installation of the fire sprinkler system. The fire sprinkler technicians testing the equipment shall be factory-trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.6 REGULATORY REQUIREMENTS

A. All system components shall be listed or approved for their intended use and shall be compatible with the system and its components. Where the terms "listed" or "approved" appear in this specification section, they shall mean UL-listed (UL Fire Prot Dir), FM-approved (FM App Guide), or listed by a nationally recognized testing laboratory (NRTL). The omission of these terms under the description of any item of equipment described shall not be construed as waiving the requirement for listing or approval. All listings or approvals shall be based on an existing ANSI or UL published standard.

B. Compliance with NFPA standards is mandatory. This includes advisory provisions listed in the appendices of such standards, as though the word "shall" had been substituted for the word "should" wherever it appears. In the event of a conflict between specific provisions of this specification section and applicable standards, this specification section shall govern.

C. Install all work in full conformance with the requirements of all local and governmental authorities having jurisdiction over these matters, utility company requirements, and requirements of the latest issues of all applicable Codes, including the IBC and IFC.

D. The fire protection installation and the installing contractor shall comply fully with all city, county and state laws, ordinances and regulations applicable to fire protection installations.
E. Should any change in plans or specification be required to comply with governmental regulations, the contractor shall notify the Engineer at the time of submitting his bid.

F. Secure and pay for necessary approvals, permits, inspections, etc., and deliver the official records of the granting of permits to the SRP Representative without additional cost to SRP.

G. A Work Authorization is required for all wet sprinkler work. The SRP Project Manager (PM) shall apply for and receive the Work Authorization. The fire protection contractor will receive the Work Authorization from the SRP PM. The Work Authorization must be prominently displayed at the jobsite before any work, to include demolition, can begin. Upon completion of the work, a final inspection by the SRP Fire Marshal, and the satisfactory resolution of all issues identified by the Final Inspection, the SRP Fire Marshal shall sign and close out the Work Authorization which indicates acceptance of the permitted work.

1.7 VERIFYING ACTUAL FIELD CONDITIONS

A. Before commencing work, examine all adjoining work on which the contractor’s work is in any way dependent for perfect workmanship according to the intent of this specification section, and report to the SRP Representative any condition which prevents performance of first class work. No “waiver of responsibility” for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

B. The contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the SRP Representative of any discrepancy before performing the work.

1.8 COORDINATION OF TRADES

A. The contract documents are not intended to serve as coordinated construction drawings showing all minor adjustments in locations required for a fully coordinated installation that respects the work of all trades.

B. Piping offsets, fittings, and any other accessories required shall be furnished as required to provide a complete installation and to eliminate interference with other construction. Sprinklers shall be installed over and under ducts, piping and platforms when such equipment can negatively affect or disrupt the sprinkler discharge pattern and coverage.

C. Wherever the contractor’s work interconnects with work of other contractors, the contractor shall coordinate his work with other contractors to ensure that all contractors have the information necessary so that they may properly install all necessary connections and equipment. Identify all work items needing access (dampers, etc.) concealed above hung ceilings by permanent colored pins-tabs in the ceiling directly below the item.

D. Provide required supports and hangers for piping, conduit and equipment, so that loading will not exceed allowable loadings of structure. Submittal of a bid shall be a deemed representation that the contractor submitting such bid has ascertained allowable loadings and has included in his estimates the costs associated in furnishing required supports.

E. Field drilling and cutting of holes in structural decks, roofs, walls, etc., required for work under this section shall be coordinated through various trades in their respective materials and approved by the SRP Representative. All such drilling, cutting, and reinforcing costs shall be borne by the contractor.
F. Due to the type of installation, a fixed sequence of construction is required to properly install the complete systems. It shall be the responsibility of the contractor to coordinate, protect, and schedule his work with other trades in accordance with the construction sequence.

G. Cooperate with all other contractors and subcontractors to facilitate the completion of the work as a whole, subject to the direction of the SRP Representative.

1.9 SCHEDULING

A. Provide a schedule to SRP indicating the installation sequence and timeframe prior to beginning work. Provide weekly updates to SRP. All equipment, valve, piping and device installation shall be completed in time to conduct all tests as outlined in these specification sections.

B. Coordinate the Acceptance Test for each fire sprinkler system with SRP and other necessary parties identified by SRP.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants in accordance with manufacturer’s instructions.

B. All pipes shall either be capped or plugged until installation.

C. Coordinate the storage arrangement and location with SRP.

D. Deliver and store products in shipping containers/boxes, with labeling in place.

E. Provide temporary protective coating on cast iron and steel valves.

1.11 WASTE REMOVAL

A. At the conclusion of each day's work, clean up and stockpile on site all waste, debris, and trash, which may have accumulated during the day as a result of work by the contractor and of his presence on the job.

B. Sidewalks and street adjoining the property shall be kept broom clean and free of waste, debris, trash and obstructions of any kind caused by work of the contractor, which will affect the condition and safety of streets, walks, utilities and property.

1.12 SPARE PARTS

A. Repair Service/Replacement Parts: During warranty period, the service technician shall be on-site within 24 hours after notification. All repairs shall be completed within 24 hours of arrival on-site.

B. The contractor shall provide spare sprinklers, sprinkler wrench and sprinkler cabinet in accordance with NFPA 13.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Standard Products: Material and equipment shall be the standard products of a manufacturer, where possible, and not a combination of manufacturers for any particular classification of materials. Material and equipment shall be the standard products of a manufacturer regularly engaged in the
manufacture of the products for at least 2 years prior to bid opening. All materials and equipment supplied shall be new, first quality and the manufacturer’s best type and latest model capable of complying with all requirements of this specification section and shall have been in continuous production and in continuous service in commercial applications for at least 1-year. Obsolete equipment shall not be used.

B. Nameplates: Major components of equipment shall have the manufacturer’s name, model or serial number, and date of installation provided on a new plate permanently affixed to the item or equipment. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.

2.2 UNDERGROUND PIPING SYSTEMS

A. Pipe: Pipe shall comply with NFPA 24. Minimum pipe size shall be minimum 6 inches. Piping more than 5 feet outside the building walls shall comply with [Section 33 11 00] WATER UTILITY DISTRIBUTION PIPING. A continuous section of welded stainless steel fire water service piping from a point outside the building perimeter to a flanged fitting at least 1-foot above the finished floor within the building is acceptable.

B. Fittings and Gaskets: Fittings shall be ductile-iron conforming to AWWA C110/A21.10 with cement mortar lining conforming to AWWA C104/A21.4. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile-iron pipe joints shall conform to AWWA C111/A21.11.

C. Gate Valve and Indicator Posts: Installation shall comply with NFPA 24. 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.

D. Valve Boxes: Except where indicator posts are provided, for each buried valve, provide a cast-iron, ductile-iron, or plastic valve box of a suitable size. Plastic boxes shall be constructed of acrylonitrile-butadiene-styrene (ABS) or inorganic fiber-reinforced black polyolefin. Provide cast-iron, ductile-iron, or plastic cover for valve box with the word "WATER" cast on the cover. The minimum box shaft diameter shall be 5.25 inches. Coat cast-iron and ductile-iron boxes with bituminous paint applied to a minimum dry-film thickness of 10 mils.

E. Buried Utility Warning and Identification Tape: Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape 3 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold block letters continuously and repeatedly over the entire tape length. Warning and identification shall read "CAUTION BURIED WATER PIPING BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2.3 ABOVEGROUND PIPING SYSTEMS

A. Pipe: Pipe shall be standard weight conforming to ASTM A795, ASTM A53, or ASTM A135. Piping less than 3-inch in diameter shall be minimum schedule 40 and joined by threaded fittings. Piping 4 inches and greater shall be minimum schedule 10 and joined by threaded, grooved or flanged fittings. Pipe in which threads or grooves are cut shall have a corrosion resistance ratio (CRR) of 1.00 or greater after threads or grooves are cut. Pipe shall be marked as to the brand or name of the manufacturer, kind of pipe and the ASTM designation in accordance with the "Product Marking" provisions of the ASTM standard.

B. Plastic Pipe: Plastic piping (PVC, CPVC, polybutylene) is not permitted.
C. Grooved Fittings and Couplings: Grooved fittings, couplings and bolts shall be provided by the same manufacturer. Fittings and couplings shall be malleable iron complying with ASTM A47 or ductile-iron complying with ASTM A536. Couplings shall be of the rigid type except that flexible type will be provided where flexible joints are specifically required by NFPA 13. Coupling gaskets shall be Grade E (EPDM) approved for fire protection service. Gasket shall be the flush type that fills the entire cavity between the coupling and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A183 and shall be cadmium plated or zinc electroplated. Plain-end fittings with mechanical couplings, fittings which require drilling a hole in the pipe, and fittings which use steel gripping devices to bite into the pipe, shall not be used.

D. Non-Grooved Fittings: Non-grooved fittings shall be threaded or flanged. Threaded fittings shall be cast-iron conforming to ASME B16.4, malleable iron conforming to ASME B16.3 or ductile-iron conforming to ASTM A536. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are screwed shall be threaded type. Plain-end fittings with mechanical couplings, fittings which require drilling a hole in the pipe, and fittings which use steel gripping devices to bite into the pipe, shall not be used.

E. Flanges and Gaskets: Flanges shall conform to NFPA 13 and ASME B16.1. Flanges shall be the type that are welded or threaded to the pipe. Flanges which are bolted to grooved pipe shall not be permitted. Gaskets shall be full-face type EPDM or other approved material.

F. Pipe Hangers: Hangers shall be listed or approved and be of the type suitable for the application, construction and size pipe involved. Earthquake bracing shall be listed.

G. Control Valve: Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type or butterfly type and shall be listed or approved.

H. Check Valve: Check valve 2 inches and larger shall be listed or approved. Check valves 4 inches and larger shall be of the swing type with flanged cast-iron body and flanged inspection plate, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

I. Hose Valve: Valve shall comply with UL 668 and shall have a minimum rating of 300 pounds per square inch. Valve shall be non-rising stem, all bronze, 90-degree angle type, with 2 1/2-inch American National Standard Fire Hose Screw Thread (NH) male outlet in accordance with NFPA 1963. Hose valves shall be equipped with lugged cap with drip drain, cap gasket and chain. Valve finish shall be polished brass.

2.4 ALARM INITIATING AND SUPERVISORY DEVICES

A. Sprinkler Water flow Indicator Switch, Vane Type: Switch shall be vane type with a cast aluminum housing. The device shall sense water movements and be capable of detecting a sustained flow of 10 gallons per minute or greater. The device shall contain a retard device adjustable from 0 to 90 seconds to reduce the possibility of false alarms caused by transient flow surges. The switch shall be tamper resistant and contain two SPDT (Form C) contacts arranged to transfer upon removal of the housing cover and shall be equipped with a silicone rubber gasket to assure positive water seal and a dustproof cover and gasket to seal the mechanism from dirt and moisture.

B. Valve Supervisory (Tamper) Switch: Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain two sets of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

2.5 SPRINKLERS
A. Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Extended coverage sprinklers shall not be used.

B. Areas with finished ceilings shall have the following characteristics:

1. Pendent or sidewall, quick-response, recessed, white finish (unless noted otherwise), ordinary temperature rated, unless ambient temperatures require a higher temperature rating.

C. Areas without finished ceilings shall have the following characteristics:

1. Pendent or upright type, quick-response, brass, ordinary temperature rated, unless ambient temperature requires the installation of sprinklers with higher temperature ratings.

D. Sprinklers shall be of the same manufacturer and same temperature characteristics throughout any single room or area, but not necessarily throughout the entire building.

2.6 BACKFLOW PREVENTION ASSEMBLY

A. [Reduced-pressure principle][Double-check] valve assembly backflow preventer complying with ASSE 1013, ASSE 1015 and AWWA M14. Each check valve shall have a drain. Backflow prevention assemblies shall have current "Certificate of Approval from the Foundation for Cross-Connection Control and Hydraulic Research, FCCCHR List" and be listed for fire protection use. Listing of the specific make, model, design, and size in the FCCCHR List shall be acceptable as the required documentation.

B. Backflow Preventer Test Connection: Test connection shall consist of a series of listed hose valves with 2 1/2-inch National Standard male hose threads with cap and chain. Provide one valve for each 250 gpm of system demand, and provide enough valves to flow the total system design demand, including interior hose steam allowances, during the test. Provide a permanent sign that reads "TEST VALVES" immediately adjacent to these valves on the wall.

2.7 FIRE DEPARTMENT CONNECTION

A. Fire department connection shall be [freestanding][projecting][flush] type with cast brass body, matching [wall ]escutcheon lettered "Auto Spkr" with a [polished brass][chromium-plated] finish. The connection shall have individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2 1/2-inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963 and comply with UL 405.

2.8 ACCESSORIES

A. Sprinkler Cabinet: Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in a suitable metal or plastic cabinet. Spare sprinklers shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

B. Pipe Escutcheon: Escutcheons shall be polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or set screw.

C. Sprinkler Guard: Guards shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers subject to damage.
D. Identification Sign:

1. Furnish and install properly lettered and approved metal or plastic signs to each control valve, alarm device, inspector’s test valve, drain valve, and alarm bypass valve. Each sign shall indicate the normal valve position as well as the portion of the system that the valve serves. Valve identification signs shall be minimum 6 inches wide x 2 inches high with enamel baked finish on minimum 18 gage steel or 0.024-inch aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain", auxiliary drain", "inspector's test", "alarm test", "alarm line", and similar wording as required to identify operational components.

2. Permanently affix metallic hydraulic design data nameplates complying with NFPA 13 to the riser of each system. Hydraulic information shall be permanently engraved on the nameplate. The use of permanent marker only is not acceptable.

3. Provide a laminated 8.5-inch x 11-inch diagram, hung on each riser, showing the floor area protected by that riser.

2.9 SPECIALTY SPRINKLER FITTINGS

A. Listed or approved, made of steel, ductile-iron, or other materials compatible with piping.

B. Drop-Nipple Fittings: Adjustable drop nipples are not permitted.

C. Mechanical-T Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlet.

D. Mechanical-Cross Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlets.

E. Sprinkler, Drain and Alarm/Inspector’s Test Fittings: Cast-iron or ductile-iron body; with threaded inlet and outlet, test valve, and orifice and sight glass.

F. Sprinkler, Branch Line Test Fittings: Brass body; with threaded inlet and capped drain outlet and threaded outlet for sprinkler.

2.10 PRESSURE GAUGES

A. Pressure gauges shall be UL-listed (UL 393), 3 1/2-inch to 4 1/2-inch diameter dial with dial range of 0 to 250 pounds per square inch gauge.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. The installation shall be in accordance with the applicable provisions of NFPA 13, NFPA 24, NFPA 1963 and publications referenced herein.

B. The Work Authorization must be prominently displayed at the job site before any work, to include demolition, can begin.

C. Upon completion of the work, a final inspection by the SRP Fire Marshal, and the satisfactory resolution of all issues identified by the Final Inspection, the SRP Fire Marshal shall sign and close out the Work Authorization which indicates acceptance of the permitted work.
3.2 UNDERGROUND PIPING INSTALLATION

A. The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be 3 feet from the top of the pipe.

B. The supply line shall terminate inside the building with a flanged piece, the bottom of which shall be set not less than 6 inches above the finished floor. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block shall be provided at the elbow where the pipe turns up toward the floor.

C. Joints shall be anchored in accordance with NFPA 24 using pipe clamps and steel rods from the elbow to the flange above the floor and from the elbow to a pipe clamp in the horizontal run of pipe.

D. Buried steel components shall be provided with a corrosion protective coating in accordance with AWWA C203. Piping more than 5 feet outside the building walls shall meet the requirements of [Section 33 11 00] WATER UTILITY DISTRIBUTION PIPING.

3.3 ABOVEGROUND PIPING INSTALLATION

A. Piping: Group piping at common elevations where practical. Route piping in an orderly manner, plumb and parallel to the building structure where practical and as indicated on the approved drawings.

B. Piping in Exposed Areas: Exposed piping shall be installed so as not to diminish exit access widths, corridors, or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

C. Fittings: Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes. Install unions adjacent to each valve in pipes 2 inches and smaller. Unions are not required on flanged devices or in piping installations using grooved joints. Install flanges or flange adapters on non-grooved valves, apparatus, and equipment having 2 1/2-inch and larger connections.

D. Pendent Sprinklers: Drop nipples to pendent sprinklers shall consist of minimum 1-inch pipe with a reducing coupling into which the sprinkler shall be threaded. Where sprinklers are installed below suspended or dropped ceilings, drop nipples shall be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished spaces. The outlet of the reducing coupling shall not extend more than 1-inch below the underside of the ceiling. On pendent sprinklers installed below suspended or dropped ceilings, the distance from the sprinkler deflector to the underside of the ceiling shall not exceed 4 inches. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area.

1. All sprinklers in suspended ceilings shall be center of tile (+/- 2 inches).

E. Upright Sprinklers: Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 30 inches in length shall be individually supported.

F. Install specialty sprinkler fittings according to manufacturer's written instructions.

G. Pipe Joints: Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints shall be permitted, only if welding operations are performed as required by NFPA 13 at the contractor's fabrication shop, not at the
project construction site. Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer’s latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings, and grooving tools shall be products of the same manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used to conceal locations, such as behind solid walls or ceilings, unless an access panel is shown on the drawings for servicing or adjusting the joint.

H. Reducers: Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings will not be permitted. When standard fittings of the required size are not manufactured, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2-inch.

I. Pipe Penetrations: Cutting structural members for passage of pipes for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile-iron or cast-iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be firestopped with a listed or approved through-penetration firestopping assembly. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

J. Escutcheons: Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

K. Inspector’s Test Connection: Unless otherwise indicated, test connection shall consist of 1-inch pipe connected to the system riser; a test valve located approximately 7 feet above the floor; a sight glass assembly; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector’s Test". The discharge orifice shall be located outside the building wall directed so as not to cause damage to adjacent construction or landscaping during full flow discharge. Concrete splash blocks shall be provided.

L. Drains: Main drain piping shall be provided to discharge at a safe point outside the building. Auxiliary drains shall be provided as required by NFPA 13. Concrete splash blocks shall be provided.

M. Hangers and Supports: Comply with NFPA 13 for hanger materials and installation.

N. Sway Brace Protection: Install piping according to NFPA 13 to protect from building sway damage.

O. Identification Signs: Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be permanently marked and permanently affixed to each sprinkler riser as specified in NFPA 13.
3.4 LABELING AND IDENTIFICATION
   A. Manufacturers pipe labeling shall be visible.
   B. Identify all bulk feed, cross mains, primary and secondary mains at maximum 20-foot intervals with red stenciled or adhesive pipe labels, readable from floor level.

3.5 ELECTRICAL WORK
   A. Alarm signal wiring connected to the building fire alarm control system shall be by the fire alarm subcontractor.

3.6 PROTECTIVE PAINTING
   A. Provide protective painting as herein specified.
      1. Metal surfaces shall first be thoroughly wire brushed and cleaned of all dirt, rust, grease, or other foreign matter before priming coat is applied.
      2. Paint all sprinkler piping exposed to view, except stainless steel piping, red.
   B. Clean up all equipment and leave in condition for finish painting before acceptance.
   C. Provide a heavy field coat of black asphaltum paint on all steel pipe, cradles, vibration isolating mounts, and the like, that will be encased or partially encased in building construction, set in cement or fill, before items are built into the general construction.

3.7 PRELIMINARY TESTS
   A. The system, including the underground water mains, and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24. Upon completion of specified tests, complete certificates as specified in paragraph SUBMITTALS.
   B. Experienced technicians regularly employed by the contractor in the installation of the system and manufacturer’s representative referred to elsewhere in this section shall conduct the testing.
   C. Underground Piping.
      1. Flushing: Underground piping shall be flushed in accordance with NFPA 24. This includes the requirement to flush the lead-in connection to the fire protection system at a flow rate not less than the calculated maximum water demand rate of the system.
      2. Hydrostatic Test: New underground piping shall be hydrostatically tested in accordance with NFPA 24. The allowable leakage shall be measured at the specified test pressure by pumping from a calibrated container. The amount of leakage at the joints shall not exceed 1.89 L2 quarts per hour per 100 gaskets or joints, regardless of pipe diameter.
   D. Aboveground Piping.
      1. Hydrostatic Test: Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than 200psi or 50psi in excess of maximum system operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or
visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

2. **Backflow Preventer Full Forward Flow Test:** Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose steams, as specified in NFPA 13. Provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5-inch diameter hoses, playpipe nozzles, calibrated pressure gauges, pitot tube gauge, plus all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. Provide a metal placard on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate. The pressure drop shall be compared to the manufacturer’s data.

3. **Alarm Devices:** Each alarm switch shall be tested by flowing water through the inspector’s test connection. Each water-operated alarm device shall be tested to verify proper operation.

4. **Main Drain Flow Test:** Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

### 3.8 FINAL TEST

**A.** The system will be considered ready for acceptance testing only after the following have been accomplished:

1. Preliminary tests have been made and deficiencies corrected.
2. Testing reports have been submitted and approved.

**B.** Final acceptance testing shall be coordinated and performed by the contractor, in the presence of SRP Fire Protection Division. In order to assure attendance of the necessary representatives, each representative scheduled to witness the test shall be provided a minimum of 5 working days' notification of the proposed test date by the contractor. The test shall not be conducted until all parties agree on the scheduled test date. The contractor shall provide all the necessary personnel and equipment to conduct the tests.

**C.** The final acceptance test shall be a repeat of preliminary tests and shall include operation of control valves and flowing of inspector’s test connections to verify operation of associated workflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. In addition, the contractor shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. The contractor shall correct system failures and other deficiencies identified during testing and shall retest portions of the system affected by the required corrections.

**D.** If the Final Acceptance Test fails, the contractor shall pay all costs incurred to SRP for any and all retesting.

**E.** Upon satisfactory completion of the tests, the contractor shall leave the system in proper working order.
F. Warranty: Except as otherwise expressly provided in the contract documents, and excepting only items of routine maintenance, ordinary wear and tear or unusual abuse or neglect, contractor guarantees all work executed by the contractor and all supplies, materials, and devices of whatsoever nature incorporated in, or attached with the work, or otherwise delivered to SRP as part of the work pursuant to the contract to be absolutely free of all defects of workmanship and materials for a period of 2 years after final acceptance of the work by SRP. Include service directory with telephone numbers for 24-hour emergency service.

3.9 TRAINING

A. Instructor: Include in the project the services of an instructor, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided. The instructor shall train the employees designated by SRP, in the care, adjustment, maintenance, and operation of the fire sprinkler system. Each instructor shall be thoroughly familiar with all parts of this installation. The instructor shall be trained in operating theory as well as in practical O&M work. Submit the instructor’s information and qualifications including training history to SRP prior to training.

B. Required Instruction Time: Provide [4][8] hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as selected by SRP. The instruction may be divided into two or more periods at the discretion of SRP. The training shall allow for rescheduling for unforeseen maintenance and/or fire department responses.

END OF SECTION