SECTION 15300

FIRE SPRINKLER SYSTEMS

1. PART 1 – GENERAL

1.1. SUMMARY

1.1.1. Design, furnish, install, test, and guarantee a completely operable and approved fire sprinkler system, which is in full compliance with Contract Documents, as indicated on the drawings, described herein, and as otherwise required.

1.1.2. Design and installation of a hydraulically calculated wet pipe sprinkler system throughout the buildings system including all interior areas, all exterior soffits, all concealed spaces, and provisions for future tenant improvements where indicated on drawings.

1.1.3. Design and installation of a hydraulically calculated wet pipe sprinkler system shall include all piping and alarms to outside the building, including connection to exterior site and street piping.

1.1.4. Provide wet sprinkler system with electric fire detection devices as required.

1.1.5. Connection of fire sprinkler system to site fire service lateral.

1.1.6. Provide test valves, drain lines, and all other inspection components.

1.1.7. All coring, drilling and chasing required for piping installation, as approved by Architect and Owner's Representative.

1.1.8. Local audible alarm and connection points for central station monitoring, as required by Local Fire Department and as specified.

1.1.9. Fees, permits, inspections and tests, including disinfection per County Health standards.

1.1.10. Provide a water flow and pressure test information near the point of connection.

1.1.11. Provide all engineering, design, and hydraulic calculations for wet sprinkler system.

1.1.12. The fire sprinkler contractor shall provide a Registered Mechanical Professional Engineer's stamp and proof of professional liability insurance with fire sprinkler submittal.

1.1.13. Alarm provisions as hereinafter described.

1.1.14. All related piping components and supporting and anchoring provisions.

1.1.15. Excavation and backfilling.

1.1.16. Testing, guarantees, and all other work necessary to provide a complete approved installation.

1.1.17. Coordination of electrical requirements.

1.1.18. Complete fire sprinkler submittal shall be sent to the Architect and Local Fire Department for approval.

1.2. RELATED SECTIONS

1.2.1. Section 15010 General Provisions

1.3. SUBMITTALS

1.3.1. Comply with specification Section 15010 "General Provisions".

1.3.2. Required Submittals

1.3.2.1. Sprinkler Heads (Indicate locations of usage).

1.3.2.2. Alarm Components.

1.3.2.3. Piping, Valves, and Accessories

1.3.3. Required Shop Drawings

1.3.3.1. Certified water flow and pressure measurements from site conditions.

1.3.3.2. Building piping systems.

1.3.3.3. Site piping systems.

1.3.3.4. Hydraulic calculations.

1.4. QUALITY ASSURANCE

1.4.1. The fire sprinkler engineering, design and hydraulic calculations must be engineered by a Registered Mechanical Professional Engineer or a Registered Fire Protection Professional Engineer in the State of California with at least five years of experience in the area of fire protection design.

1.4.2. Provide Registered Mechanical or Fire Protection Professional Engineer's stamp on sprinkler drawings, calculations and reports.

1.4.3. Provide proof of professional liability insurance with fire sprinkler submittal.

1.4.4. The fire sprinkler system including but not limited to the wet sprinkler system and its components shall be engineered and installed by a firm regularly engaged in the engineering, design and installation of fire protection systems in accordance with the requirements of the National Fire Protection Association.

1.4.5. The engineering, design and hydraulic calculations, must signed by the same Registered Mechanical Professional Engineer or a Registered Fire Protection Engineer.

1.4.6. The engineering, design and installation firm shall have had a minimum of five years experience in fire protection system engineering, design and installation for projects of similar nature to this project.

1.4.7. The Registered Mechanical Professional Engineer or a Registered Fire Protection Engineer that is engineering the fire protection systems shall have been licensed in the State of California for at least five years.

1.4.8. The Registered Mechanical Professional Engineer or a Registered Fire Protection Engineer of record must have professional liability insurance. The aggregate amount of professional liability insurance will be a minimum of $500,000 per year.

1.4.9. The professional liability insurance must be maintained for a period of not less than five years.

1.4.10. The reviewing engineer will require evidence to support the above qualifications before approval of the submittal is possible.

1.4.11. Installing contractor shall have a California C-16 license.

1.4.12. For actual fabrication and installation of sprinkler systems, use only personnel who are thoroughly trained and experienced with the products involved, and in the recommended methods of their installation.

1.5. REFERENCES

1.5.1. In addition to complying with all pertinent standards, codes and regulations, comply with all requirements of:

1.5.1.1. Local Fire Department requirements.

1.5.1.2. Water Department requirements.

1.5.1.3. NFPA 13, 24, 25 and 72 (most recent editions).

1.5.1.4. U.L. and F.M. rating requirements for products.

1.6. SUBMITTAL AND SHOP DRAWING REVIEW PROCESS

1.6.1. Phase 1 - Preliminary Shop Drawings - Partial Submittal - Review of Exposed Pipe, Sprinkler Head Locations and Fire Riser Locations

1.6.1.1. Indicate on preliminary shop drawings all exposed pipe, sprinkler head locations and fire riser locations. Submit the preliminary shop drawings to the Architect for their review.

1.6.1.2. Make any corrections and resubmit to Architect. After the Architect and Mechanical Engineer as reviewed and approved Phase 1 Preliminary Shop Drawings proceed to Phase 2 Final Shop Drawings.

1.6.2. Phase 2 - Final Shop Drawings - Complete Submittal

1.6.2.1. Provide results of field verify water flow rates and residual pressure measurements.

1.6.2.2. Send all design documents to the Architect. The Architect, Mechanical Engineer, Structural Engineer, Electrical Engineer and Civil Engineer shall review the design documents.

1.6.2.3. After the review of the Architect and Engineers, the submittal shall be sent to the Local Fire Department for their approval.

1.6.2.4. After the Local Fire Department's approval, the design documents shall be submitted to Architect and Engineers for their final review and approval.

1.6.2.5. If required by any reviewing agency, or if review comments require extensive revisions, the submittal shall be revised and resubmitted back for reviewing and approvals as noted above.

1.6.2.6. The final approved shop drawings and hydraulic calculations shall constitute the contract working drawings.

1.6.2.7. Refer to NFPA 13, 1996 Edition for complete submittal requirements.

1.7. COORDINATION

1.7.1. Coordinate work with that specified in other sections before start of installation.

1.7.2. Piping runs found to be in conflict with such work as a result of neglected coordination shall be removed and reinstalled in new locations designated by the Architect or Owner's Representative at no additional expense to the Owner.

1.7.3. Contractor shall contact the Architect or Owner's Representative and obtain necessary information to design fire sprinkler system to fit into allotted spaces without interfering with work by other trades.

1.7.4. Coordinate with Plumbing section for size and location of drain receptors, where required for draining and testing fire sprinkler risers and systems. All drain pipes shall discharge into the receptors furnished by plumbing contractor. Wall-mounted discharge of drains or test connections will not be accepted.

1.8. FLOW TESTS

1.8.1. Water supply data for system design shall be determined using current (within one year of submittal to authorities having jurisdiction) flow test information. Sprinkler Contractor shall obtain and verify flows, static and residual pressures and related hydraulic data.

1.8.2. Fees to obtain flow test information shall be paid by this contractor doing the sprinkler work.

1.8.3. Data used for system design must conform to actual on-site conditions at time of final inspection. This information is subject to verification by Architect or Owner's Representative and all authorities having jurisdiction.

1.8.4. Static and residual pressures used for calculations shall be reduced by a minimum of 10% below actual water supply data. A reduction of greater than 10% shall be observed if required by any authority having jurisdiction. If no current data if available measure both water flow and pressure at this location. Provide this information in a report certified by the Local Fire Department or Local Water Authority in the fire sprinkler submittal.

1.9. DESIGN REQUIREMENTS

1.9.1. The approval of the Fire Sprinkler Design Documents is a long lead item. Submit Design Documents within 30 working days of "Notice to Proceed" to the Architect.

1.9.2. Principle dimensions, including tie-in dimensions to water main at point of connection, interior riser and details of construction.

1.9.3. Sizes, types and locations of sprinklers, piping, valves, test connections, fittings, grooved couplings, braces and hangers.

1.9.4. Provide the location of all switches, bells and electrical connections for alarm system, as described in this specification.

1.9.5. Provide the location of all beams, soffits, skylights, ductwork, ceiling grilles and other architectural features, which may affect or impact the design or installation of fire protection system. Include reflected ceiling plans and mechanical ductwork layout on fire sprinkler drawings.

1.9.6. Hydraulic calculations, formatted to meet the data requirements of N.F.P.A. 13, Chapter 6, and acceptable to all authorities having jurisdiction. Computer programs that automatically locate the hydraulically most remote area of gridded systems are not acceptable unless at least two shifted design areas are included in calculations.

1.9.7. Approval stamp of Local Fire Department, Owner's Insurance, and all other authorities having jurisdiction, on drawings, calculations, data sheets, and other documentation, requiring such approval.

1.9.8. Materials list describing all major system components, including but not limited to, backflow prevention devices, valves, piping, fittings, grooved couplings, hangers, bracing, sprinkler heads and appurtenances.

1.9.9. Submit six sets of hydraulic calculations and six sets of shop drawings for the entire system, including site piping to the Architect.

1.9.10. Shop drawings shall include general pipe routing and sprinkler head locations.

1.9.11. Drawings shall be for interior and exterior site piping systems (including underground piping).

1.9.12. Provide water flow and pressure tests to verify the available water flow rate and residual pressure. When submitting Shop Drawings, include copies of Local Fire Department certified water system test reports and all hydraulic calculations with system curves. Indicate location of water flow and pressure tests, and show these test results as a basis for the calculations.

1.9.13. Provide detailed building drawings showing building construction features, ductwork, lights, diffusers, ceiling tiles, equipment and obstructions to show that proper clearance is maintained for piping, sprinkler heads, etc.

1.9.14. Provide dimensional elevations and sizes of piping and provide sufficient sectional views so pipe routing can be checked for clearances. Refer to all other Contract Documents to confirm the exact disposition and number of sprinkler heads to be installed.

1.9.15. The design and installation shall conform to the requirements of other applicable sections of this specification and of NFPA Standards and the specific requirements of the Local Fire Department.

1.9.16. All materials and equipment used in the installation of fire protection systems shall be listed as approved by Underwriters' Laboratories, Inc., "List of Inspected Fire Protection Equipment and Materials", or approved by other appropriate, nationally recognized testing laboratories for use in sprinkler systems, and shall be the latest design of the manufacturer.

1.9.17. The hydraulic calculations and system design shall conform to requirements of applicable sections of NFPA standards.

1.10. COVERAGE AND SCOPE

1.10.1. Areas shall be designed for specific "Hazard" classifications as designated by the Local Fire Department.

1.11. REFERENCES

1.11.1. Except as modified by governing codes and these specifications, comply with applicable provisions and recommendations of the National Fire Protection Association, latest edition as follows:

1.11.1.1. Current NFPA 13: Standard for the Installation of Sprinkler Systems
1.11.1.2. Current NFPA 13A: Recommended Practice for the Care and Maintenance of Sprinkler Systems.
1.11.1.3. Current NFPA 24 Standard for the installation of Private Fire Mains

2. PART 2 - PRODUCTS

2.1. PIPE AND FITTINGS

2.1.1. All pipe and fittings shall be new, acceptable to authorities having jurisdiction, per all applicable standards and codes, and free from damage and distortion.

2.1.2. Black steel, Schedule 40, ASTM A-135/795, for all piping, with threaded joints and fittings.

2.1.3. Black steel, Schedule 10, ASTM A-135/795, for all piping, with non-threaded joints and fittings.

2.1.4. Threaded fittings shall be of cast or malleable iron, class 125 or 150, conforming to ANSI B16.3 and ANSI B16.4.

2.1.5. Flanged fittings shall be provided where required. Flanges shall be of cast iron, class 125, conforming to ANSI B16.1.

2.1.6. Welded fittings shall be of wrought steel, conforming to ANSI B16.9.

2.1.7. One-piece reducing fittings shall be used wherever a change is made in pipe size. Bushings shall not be used, except where fittings of the required size are not available.

2.1.8. Grooved thinwall steel pipe connections shall be made using a U.L./F.M. approved ductile iron coupling, with rubber gasket. Installation shall be per manufacturer's instructions.

2.1.9. All piping shall be joined with welded, threaded or grooved fittings. Fittings for hole cut connections are not acceptable.

2.2. UNDERGROUND PIPE AND FITTINGS

2.2.1. All pipe and fittings shall be new, acceptable to authorities having jurisdiction, comply with all applicable standards and codes, and free from damage and distortion.

2.2.2. Pipe shall be cast or ductile iron, or C-900 PVC, as shown on plans or required by water department. Pipe under structural footings shall be cast or ductile iron only, to at least 5'-0" beyond outside face of building.

2.2.3. Fittings shall be ductile iron, class 250, flanged or mechanical joints as required. Proper thrust restraint shall be provided per N.F.P.A. 24.

2.2.4. Exterior piping joints shall be U.L. approved push-on, of bell and spigot joints. Thrust blocks shall be provided at all changes in direction.

2.3. 2.2 VALVES

2.3.1. Valves shall be U.L. approved, and located and installed in conformance with Local Fire Department and Insurance Company requirements, 175 PSI design. Valves by, Jenkins, Crane, Grinnell, and Viking, or other manufacturers listed in the FM approval guide.

2.3.2. Control valve: Provide iron, double disc, bronze mounted gate valve, with adjustable indicator post. Post shall be located and field painted as required by serving fire department. All control valves shall be chained and locked in the open position; locks to be fitted with breakable shanks. Provide tamper switches.

2.3.3. Check valves shall be iron body, bronze mounted, horizontal swing check. As acceptable to authorities having jurisdiction, iron body, bronze, disk wafer check may be used. Check valve shall be U.L/F.M. approved for fire protection use, and recommended by the manufacturer for direct bury where such installation is to be required. Iron body, bronze disk threaded or grooved swing check may be installed at Fire Department Connection, and located as acceptable to serving fire department.

2.3.4. Drain valve: Angle pattern type, screwed with brass bodies and trim and iron wheel handles. Provide brass, rubber disc, angle or globe pattern, with screwed ends, rated 200psi WOG.

2.4. 2.14 VALVE CHART

2.4.1. Provide chart in enclosed frame, indicating all valve locations and system functions.

2.5. SPRINKLER HEADS

2.5.1. All sprinklers shall be of similar make and appearance.

2.5.2. All heads shall have the same bulb or link and finish except where otherwise required by exposure to heat sources, freezing temperatures, corrosive environment, etc.

2.5.3. Sprinkler heads are required in all areas above and below ceilings.

2.5.4. Interior sprinkler heads in areas with suspended ceilings or in areas with drywall (hard) ceilings. Provide be semi-recessed with chrome finish. Sprinkler heads shall be spray pendent, bulb or fusible link with matching escutcheon.

2.5.5. Exterior sprinkler heads in areas with suspended ceilings or in areas with drywall (hard) ceilings shall be corrosion-resistant finish semi-recessed with Teflon finish with matching escutcheon. Finish of all corrosion-resistant sprinklers shall be U.L./F.M. approved.

2.5.6. For concealed areas, unfinished ceilings, and service areas provide standard spray upright or pendent, with rough brass finish. Where required, escutcheons shall be two-piece, style #401 with chrome finish at mechanical, electrical and storage room ceilings.

2.5.7. Side wall heads may be provided if required in special condition areas.

2.5.8. Brass upright heads may be provided in areas with no ceilings.

2.5.9. Temperature Ratings and Response Type

2.5.9.1. Heads below finished ceilings, and in all other occupied areas shall have a temperature rating of Ordinary (155-165° F), except as noted below.

2.5.9.2. Heads in unventilated concealed spaces, and at shell piping systems above and below mezzanines, shall have a temperature rating of Intermediate (200-212° F), unless otherwise required by code.

2.5.9.3. All sprinklers in Light Hazard areas shall be listed, quick-response type.

2.6. PROTECTION OF SPRINKLER HEADS

2.6.1. Provide U.L./F.M. listed guards for sprinkler heads located in areas susceptible to mechanical damage.

2.7. HANGERS AND SUPPORTS

2.7.1. Provide hangers approved by U.L./F.M. and N.F.P.A. 13 for fire sprinkler systems. Shop-fabricated supports shall be designed to meet requirements of N.F.P.A. 13, and must be certified by a registered professional engineer.

2.7.2. Provide earthquake bracing approved by U.L./F.M. and N.F.P.A. 13. Locations of all bracing shall be clearly shown on shop drawings. All bracing shall be assembled, calculated and installed per N.F.P.A. 13, section 4-14.4.3.5. All calculations shall be shown on shop drawings or included in the materials submittal package.

2.7.3. Size all anchors and fasteners per N.F.P.A. 13. All lag screws, bolts and drive screws shall be installed as required by codes and accepted good practices. Pilot holes shall be drilled in wood framing members as required by Architect's structural engineer. Under no circumstances shall threaded fasteners or bolts be hammered or pounded into framing.

2.7.4. All fasteners and/or anchors proposed for use in concrete construction shall be specifically listed and approved for use on fire sprinkler systems in seismic zones. Powder-driven studs shall not be used unless all system components including installation tool and pins are listed.

2.8. ACCESSORY CABINET

2.8.1. Provide metal sprinkler cabinet for a reserve supply of sprinkler heads, as required by N.F.P.A. 13. Include one suitable head wrench for each type of sprinkler installed. Stock shall include all types and temperature ratings installed. Locate as directed by Architect.

2.9. ESCUTCHEON PLATES

2.9.1. Provide chrome plated escutcheons where piping penetrations are made through finished walls and ceilings. Plates shall be painted to resist corrosion when exterior installation is required.

2.10. CENTRAL STATION SUPERVISION

2.10.1. Furnish valve supervision, as required by authorities having jurisdiction, at all valves controlling fire protection water supplies, and any required underground conduit thereto.

2.10.2. Provide U.L./F.M. approved tamper switch, Model PIVSU-A1, or OSYSU-A1, or U.L./F.M. listed equivalent, 120VAC with one set of Form C, single pole, double throw contacts.

2.11. WIRING AND CONNECTIONS

2.11.1. Furnish and install all low (24 volt) and line (120 volt) interlocking and control wiring and conduit, and control devices necessary for the fire protection systems, including final wiring connections. Furnish wiring diagrams to other Contractors as necessary.

2.11.2. Provide wiring and conduit from alarm contacts to alarm system. Provide control function wiring and conduit.

2.12. ALARM BELL

2.12.1. Furnish and install a California State Fire Marshal approved check valve with retarding chambers, gauges, relays, etc., to operate electric alarm bell upon flow of water through sprinkler system; valve to be UL approved. Valve shall be designed to prevent false alarms due to surges in the piping system.

2.12.2. Provide 10" diameter, U.L./F.M. approved bell with identification sign, rated 120VAC, with standard mounting hardware.

2.12.3. Locate where required by authorities having jurisdiction, and as acceptable to Architect.

2.13. WATER FLOW SWITCHES

2.13.1. Provide California State Fire Marshal approved switches with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system. Alarm actuating device shall be of the mechanical diaphragm controlled water flow type without retard feature, which instantly recycles when pressure is released on the diaphragm. Coordinate location and electrical requirements with other contractors.

2.13.2. Provide U.L./F.M. approved, 120VAC with two sets of Form C, single pole, double throw contacts, and adjustable retard feature.

2.13.3. Retard shall be set by Contractor so as to prevent false alarms, and still allow audible alarm within 30 seconds.

2.14. TAMPER SWITCHES

2.14.1. Provide tamper switch on main valve and interior control valves. Division 16 shall provide alarm wiring and conduit.

2.15. ALARM CHECK VALVES

2.15.1. Check valve shall provide for the proper functioning of a water motor alarm and/or electric alarm. Valve cover shall allow for replacement of all moving parts without removing the valve from an installed position. Valve shall have flanged connections. All moving parts shall be brass, bronze or stainless steel with replaceable neoprene clapper and brass seat. Valve housing shall be tapped to allow installation of alarm accessories, two pressure gauges (one above, and one below the seat) and main drain. Provide all accessories consisting of angle valves, globe valves, orifice restriction, pipe nipples and fittings, retarding chamber, water pressure gauges and circuit closer with two sets of contacts for electric alarms. Valve shall be rated for 175 PSI working pressure. Division 16 shall provide alarm wiring and conduit.

2.16. FIRE DEPARTMENT CONNECTION AND POST INDICATOR VALVE

2.16.1. Provide single clapper, 4" x 2 1/2" two-way, Siamese fire department connection. Finish and model shall be as required by serving fire department. Provide check valve. Siamese fire department connections as be approved by jurisdictional authorities. Provide index plates designating system served.

2.16.2. Fire department connection shall be 2-way free-standing type with self-closing clapper valves and pin lug swivels and caps with chains. Furnish with type of thread as directed by the Local Fire Department.

2.16.3. Provide a post indicator valve close to fire department connection.

2.17. SIGNS

2.17.1. Identification signs shall be provided for all system and auxiliary drains, inspector's tests connections, alarms, control valves, etc., as required by NFPA codes or Local Fire Department requirements.

2.17.2. Permanently label and tag all sprinkler control valves indicating which fire zone the system controls.

3. PART 3 - EXECUTION

3.1. GENERAL INSTALLATION REQUIREMENTS

3.1.1. Prior to all work of this section carefully inspect the installed work of other sections, and verify that all such work is complete to the point where this portion of the work may properly commence in accordance with all submittals, designs, and applicable codes.

3.1.2. In the event of a discrepancy, immediately notify the Owner's Representative. Do not proceed with installation in areas of discrepancy until all such discrepancies and/or omissions have been fully reviewed and clarified.

3.1.3. Provide a monitored riser and valve for each floor of the buildings.

3.1.4. All Sprinkler piping shall be concealed unless in mechanical or equipment rooms or in rooms without ceilings. Piping shall be concealed in the following ways: above ceilings, in walls, in shafts, in mechanical or equipment rooms or in void areas.

3.1.5. Sprinkler piping shall be installed at maximum height throughout the building. Sprinkler piping shall not be installed in the middle of ceiling areas, shaft spaces or other void areas. Sprinkler piping shall be coordinated to miss other trades. Offset piping as required, to clear mechanical ductwork, piping, building structure, etc.

3.1.6. The piping installation shall be consistent with fire codes, relative to provisions for drainage and obstruction to spray pattern. Provide necessary deflectors so that sprinkler heads will not spray onto electrical equipment.

3.1.7. Sprinkler heads located 7'0" or less above finished floor elevation shall be provided with approved guards.

3.1.8. Provide appropriate supporting members for piping, which shall be attached to the building structure so that the load imposed by the piping will not exceed the limitations of the structure.

3.1.9. Sprinkler heads located near heat producing equipment shall conform to NFPA Section 13, relative to temperature ratings.

3.1.10. Provide flexible couplings, sway bracing on hangers, proper clearance around pipes passing through concrete construction, etc., to minimize forces on piping and prevent breakage.

3.1.11. Test connections shall be provided for each sprinkler system or portion of each sprinkler system and shall be located at the hydraulically most remote part of each system. Test connection shall be piped to a location where the discharge will be readily visible and where water may be discharged without damage (i.e., onto paved surfaces).

3.1.12. Drains shall be piped to discharge at safe points outside each building or to sight cones attached to site drains. Provide splash blocks for exposed pipe discharge. Provide sight cones of adequate size to readily accept the full flow from each sprinkler drain under maximum pressure. Auxiliary drains shall be provided as required by NFPA 13.

3.1.13. Provide in suitable metal cabinets, to be located adjacent to sprinkler alarm riser, the necessary number of extra heads together with wrenches of each type required NFPA.

3.1.14. Fire Department Inlet Connections shall be provided three feet above grade, with hose threads acceptable to the Local Fire Department. Prior to any submittal obtain approval from the Local Fire Department for locations.

3.1.15. Where square ceiling tiles occur, locate sprinkler heads in center of tile.

3.1.16. Heads shall be located at the exact centerline of 2' square ceiling tiles. Where 2' x 4' ceilings occur, heads shall be centered in either half of the 2' X 4' tiles with escutcheons. Coordinate with architectural reflected ceiling plans. Sprinkler heads at finished ceilings, and in exposed locations shall form a symmetrical pattern.

3.1.17. Sprinkler heads in stairwells to be supplied through the wall from adjacent ceiling space to eliminate exposed branch piping.

3.1.18. All installations shall be per referenced standards. Follow manufacturer's directions and recommendations in all cases as required for all approvals and warranty enforcement.

3.1.19. All cutting shall be subject to approval by the Architect. Beams, decks and other structural components shall not be cut or altered in any way unless previously approved.

3.1.20. Provide flexible couplings where required to provide expansion capability, and for earthquake protection per NFPA 13. Provide sway bracing as required by coupling locations.

3.1.21. Entire sprinkler system shall be installed in such a manner so that it can be drained in accordance with NFPA 13. Drains shall be located at suitable points as approved by Architect. No primary or auxiliary drain shall be located in any public area or electrical room. All drains shall discharge into dedicated receptors.

3.1.22. No work shall be covered or enclosed until inspected, tested, and approved by Owner's Representative. Should any work be concealed before inspection, the Contractor shall, at Contractor's expense, uncover such work and after it has been inspected, tested and approved, provide for all repairs as may be necessary to restore work to original and proper condition.

3.1.23. Sprinkler head layout shall accommodate lighting and HVAC register locations. Coordination with the work of these sections is the responsibility of Contractor.

3.1.24. Without exception, no piping shall be run under or through any skylight or skylight well. Any additional upright or pendent sprinklers, which may be required by skylight locations, shall be the responsibility of this contractor.

3.1.25. All penetrations of wall and floor assemblies shall be suitably sleeved, patched and/or sealed in order to preserve fire rating, where applicable.

3.1.26. Location of control valves, fire department connection, and inspector's test shall be as required by authorities having jurisdiction, and as approved by Owner's Representative and Local Fire Department.

3.1.27. Local alarm bell shall be located so that it can be easily heard and seen by passersby and Local Fire Department personnel. Locate on exterior wall, 10'-0" above finished grade, as approved by Architect.

3.1.28. Provide wood or metal floor pans under and around pipe cutting/threading machines, in designated work areas, to protect floor surfaces from damage and discoloration.

3.1.29. Paint all fire sprinkler piping risers, drops and other components exposed to view in final construction as directed by Architect.

3.1.30. Underground pipe and fittings shall be installed per N.F.P.A. 24, and applicable codes and standards. Trenching, back-filling, depth of bury and size, shape and location of all thrust blocks shall be acceptable to all jurisdictional agencies.

3.1.31. Point of connection for underground fire services shall be at site fire service lateral(s), at the point where service is to enter the building. Location, size, and pipe type shall be as shown on civil plans.

3.2. FABRICATION

3.2.1. All pipe, fittings, and materials shall be prepared by qualified personnel, trained and experienced with the products involved, and the recommended methods of preparation.

3.2.2. All pipe cuts, threads, and grooves shall be made according to applicable codes, standards and accepted good practices.

3.2.3. Pipe shall be free of damage, flaws and burrs. Threads and grooves shall not be excessively shallow or deep.

3.2.4. Fittings shall be made onto the pipe no tighter than necessary. Without exception, Contractor shall replace cracked or broken fittings.

3.2.5. Excess dope and oils shall be removed before shipment to job site.

3.2.6. Welding

3.2.6.1. Welding methods shall comply with N.F.P.A. 13 and AWS D10.9, Level AR-3. Contractor shall be responsible for all welded joints and any qualifying procedures for welders and related personnel.

3.2.6.2. Holes in pipe for outlets shall be cut to full inside diameter of fitting, prior to welding in place. Holes shall be free of slag and welding residue, and of smooth continuous bore. Fittings shall not penetrate internal diameter of run piping. Holes shall be cut by hole saw or other rotary bit. Torch-cutting of holes is strictly prohibited.

3.2.6.3. All welded pipe shall be subject to inspection by Owner's Representative before it is installed. Provide documentation of acceptance, as required, at time of project close-out.

3.3. TEST AND APPROVAL

3.3.1. Prior to connecting to overhead sprinkler piping, the underground main shall be flushed in the presence of the Owner's Representative and meet with their approval.

3.3.2. Perform all tests as required by NFPA 13, and all authorities having jurisdiction. Maintain an accurate record of all tests and inspections on the job site, including date of test and inspecting agency. Systems shall be thoroughly tested in accordance with NFPA requirements, and left in good working order. Certificate of tests shall be forwarded to the Owner's representative.

3.3.3. On completing installation of sprinkler systems, the sprinkler contractor shall notify the Local Fire Department, Architect, Mechanical Engineer and Owner's Representative.

3.3.4. Entire piping system including underground mains, risers, and inside piping shall be tested under 200 PSI minimum hydrostatic pressure at lowest point of system for a period of four hours.

3.3.5. Tests shall be made in the presence of the Local Fire Department and Owner's Representative.

3.3.6. All necessary equipment, materials, and labor for tests shall be provided by Contractor.

3.3.7. After completion of the installation, the fire sprinkler contractor shall furnish a written statement to the affect that work has been completed and tested in accordance with the working drawings and specifications. This letter and Contractor's material and test certificate shall be prepared and given to the Architect for distribution.

3.3.8. Provide the NFPA Certificates to the Local Fire Department, Architect, Owner's Representative and Mechanical Engineer.

3.3.9. Before connection of interior system to underground main, underground piping shall be hydrostatically tested, flushed and accepted by authorities having jurisdiction. Provide documentation of acceptance by jurisdictional authority. All required health and bacterial tests shall be the responsibility of sprinkler contractor.

3.4. CLEAN UP

3.4.1. Equipment, appurtenances, fixtures and exposed piping shall be clean, and all excess dope and oil shall be removed. Sprinkler heads shall be cleaned without the use of any solvents.

3.4.2. Upon completion of work, remove all surplus material, debris, and equipment associated with or used in the execution of this work. Sweep work and storage areas, as required, to remove metal shavings and oily residue.

3.5. DAMAGE BY LEAKS

3.5.1. Contractor shall be responsible for damage to any part of the premises caused by leaks or breaks in the pipe installed under this Section. This shall be in effect for a period of one year from the date of the acceptance of the work of this section by the Owner's representative.

3.6. GUARANTEE

3.6.1. Contractor shall guarantee fixed fire protection system, for a period of one after date of final inspection, from leaks and other failures from materials and workmanship.

3.7. CLOSEOUT

3.7.1. Upon completion and approval of system, and prior to occupancy, provide instruction to the Owner, or Owner's representative, in all details of system operation and maintenance. Prepare and submit maintenance and operation manual.

3.7.2. Provide three copies of final inspection and certification as prescribed by Owner's Insurance Underwriter, and other authorities having jurisdiction.

3.7.3. Provide three (5) copies of system "As-Built" drawings and guarantee to the Architect. Drawings shall show actual installation details including all piping and equipment locations, room or facilities modifications, etc.

END OF SECTION