

SECTION 21 10 00 - FIRE SPRINKLERS & STANDPIPES

PART 1 - GENERAL

1.1 SUMMARY

A. Work included:

1. Provide all material, labor, equipment, design and services necessary to perform the installation of the fire sprinkler system described in the specification and as shown on the drawings.

B. Summary of work:

1. **[Provide a general description of the scope of work.]**
2. **[Designer: Describe basic details of the system. Include: Wet or dry system, calculated or pipe schedule, density/area if calculated, hazard classification, revision to existing system or new system, complete new system or individual areas to be covered, not covered, etc. (Example: Sprinkler system shall be based on Ordinary Hazard Group I (.15 GPM/1500 Sq. Ft.) or Ordinary Hazard Group II (.20 GPM/1500 Sq. Ft.)]**
3. Area reduction for quick response heads as described in NFPA 13 is allowed. Area reductions shall adhere to specific height restrictions.
4. Branch and tree layouts are standard for Owner designs. Looped cross main designs are acceptable substitutions, provided the cross main only uses a single loop and the looped main is 2-1/2 inch minimum. Grid systems are not acceptable.
5. A design or layout that differs from the Contract Documents is subject to Owner's approval.
6. New systems shall be hydraulically calculated.
7. **[The water supply for this location is *Designer: consult UW Fire Protection Engineer for water supply for the project*]**

1.2 QUALITY ASSURANCE

A. Codes and standards: This installation shall conform to the latest edition at the time of bid of each of the following:

1. NFPA 13, all appendices, Installation of Sprinkler Systems
2. NFPA, Automatic Sprinkler System Handbook
3. NFPA 14, all appendices, Standpipe and Hose Systems
4. NFPA 24, all appendices, Private Fire Service Mains
5. International Building Code, include Seattle Amendments
6. International Fire Code, including Seattle Amendments
7. International Mechanical Code, including Seattle Amendments
8. Underwriters Laboratories Fire Protection Equipment Directory
9. Factory Mutual Approval Guide

10. Seattle Fire Department Administrative Rule 9.08.05
11. Seattle Fire Department Administration Rule 9.03.04

B. Qualifications of Contractor:

1. All work shall be performed by a contractor with a valid Washington State contractor's license, and Seattle Fire Department Certification for the installation of fire sprinkler systems.
2. The system shall be designed by a NICET Level 3 certified sprinkler designer. The field installation shall be supervised at all times by a journeyman sprinkler fitter.

1.3 APPROVALS

- A. Authority Having Jurisdiction: For purposes of code compliance, the Authority Having Jurisdiction (AHJ) for this installation will be the Seattle Fire Department and the Owner's Fire Protection Engineer from EH&S. Where there are conflicts between the AHJ and the referenced codes and standards, the more stringent shall apply. If there is a question of interpretation as to which is more stringent, the Owner's Fire Protection Engineer will decide.
- B. The following agency approvals are required for all UW Medical Center & Harborview Medical Center Projects:
 1. Medical Center's Insurance Carrier.
 2. State of Washington Department of Health (Submittal review by the Washington State Fire Marshal).
- C. The following agency approvals are required for all UW Housing and Food Service Projects:
 1. Housing and Food Service Insurance Carrier.

1.4 SUBMITTALS

- A. Submittals packages shall meet the general specifications of Division 01 Section "Submittal Procedures" and shall be transmitted based on the project construction schedule as outlined in Division 01 Section "Construction Project Schedule".
- B. Submittals shall be approved by the Owner's Fire Protection Engineer prior to submitting to Seattle Department of Planning and Design (DPD) and the Seattle Fire Department and prior to fabrication and installation of the system.
- C. After approval is received from the Owner's Fire Protection Engineer, submit shop drawings to DPD for Seattle Fire Department for approval.

D. UW Medical Center, Harborview Medical Center, and Facilities Operated by Housing and Food Services:

1. Provide one copy of approved Material Submittals and Shop Drawings to the Property Insurance Carrier. Submit to:

Mr. Mike Woltersdorf
Parker, Smith & Feek
2233 112th Avenue NE
Bellevue, Washington 98004

2. Provide one copy of approved Material Submittals and Shop Drawings to designated Medical Center project personnel for submittal to the Department of Health.

E. Material Submittals:

1. Furnish via the Owner's Representative, to the Owner's Fire Protection Engineer, a complete list of equipment and products, and a manufacturer's catalog sheet for each item to be included in the project. Six copies are required, each bound separately in a soft cover 3-hole binder. All material submittals shall include all items listed in the product section and all additional items necessary to provide a complete installation.
2. Partial submittals are not acceptable and will be rejected without review. Where more than one item appears on a manufacture's catalog sheet, indicate the item or items to be used
3. Welding Submittal:
 - a. Submit via the Owner's Representative, to the Owner's Fire Protection Engineer, welding procedures that comply with NFPA 13 and Specification for Qualification of Welding Procedures and Welders for Piping and Tubing, American Welding Society, Inc. (AWS) D10.9 Standard for Building Service Piping, level AR-3. Submit the following forms:
 - 1) Typical Welding Procedure Specification (WPS)
 - 2) Typical Contractor's Procedure Qualification Test Record (PQR)
 - 3) Typical Contractor's Welder Qualification Tests Record

F. Shop Drawings/Calculations:

1. Contractor shall submit 6 sets of shop drawings hydraulic calculations and seismic brace calculations via the Owner's Representative to the Owner's Fire Protection Engineer for approval prior to submitting to DPD and the Seattle Fire Department.
2. Incomplete shop drawings will be rejected unless prior approval is requested and given from the Owner and UW Fire Protection Engineer for partial submittals. Shop drawings shall conform to and include all items as set forth in NFPA 13.

1.5 DRAWINGS OF RECORD

- A. Updating Drawings: Provide and keep up-to-date a complete record set of approved shop drawings, corrected daily to show every change from the approved shop drawings. Keep this

set of prints on the job site and use only as a record set. The Owner's Representative shall review the up-to-date drawings each month prior to the application for payment.

- B. Final Record Set: Upon completion of the work, submit the record drawings and hydraulic calculations for approval by the Owner's Fire Protection Engineer. After receiving approval, use the record set to produce a set of as-built drawings that meet the guidelines in 1A Record Documents and Submittals. Submit hydraulic calculations.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Materials and Equipment: All materials and equipment in the system shall be new and current products of a manufacturer regularly engaged in the production of such materials and equipment. Where two or more pieces of equipment are required to perform interrelated functions, they shall be products of one manufacturer.
- B. Approval Guides: Unless otherwise indicated, all products shall be listed in the latest publication of Approval Guides for Underwriters Laboratory and Factory Mutual for the service intended.
- C. Manufacturers: Manufacturer of sprinkler specialties shall be Grinnell, Reliable, Viking or approved equal unless otherwise specified.

2.2 PIPE

- A. Schedule of pipe: All pipe shall be ferrous and meet the requirements of NFPA 13. Pipe shall be Schedule 40 for threaded and cut groove pipe and Schedule 10 for roll groove application; no exceptions.
- B. Galvanized pipe: Dry pipe systems and pipe located in corrosive environments shall meet the requirements of NFPA 13, be Schedule 40 pipe, ferrous, and galvanized; no exceptions.
- C. Underground Pipe: All piping upstream of the double backflow preventer shall be ductile iron class 52 and cement-mortar lined whether inside or outside of the building.
- D. Coatings: Coat all exposed threads on galvanized pipe with a zinc rich coating. Coat all exposed threads on galvanized pipe with rust inhibitive paint.
- E. Color Coding: [***Designer: Include color coding; if Division 23 Section "Identification for Mechanical Piping and Equipment" is not included in the specifications, then include the applicable requirements in this section.**]

2.3 FITTINGS AND COUPLINGS

- A. Rust Inhibitive Paint: Coat grooved fittings and couplings with a rust inhibiting paint.

- B. Threaded Fittings: Threaded fittings shall be ductile or cast iron class 125, rated for 175 psi cold water working pressure and shall conform to ANSI B16.4, ASTM 126 and ANSI B2.1 NPT. Malleable threaded fittings will not be permitted.
- C. Nipples: No close nipples will be permitted. For short pipe connections use standard short nipples.
- D. Adjustable Nipples: Adjustable drop nipples must be of double o-ring seal design.
- E. Thread-O-Lets: Shop-welded Thread-O-Lets may be used where a certified welder is used, meeting the requirements of Paragraph 1.4.E.3. and if the Thread-O-Lets are listed.
- F. Grooved Fittings: 90's, 45's, Tees, and reducers shall be malleable iron or ductile. The fittings shall be by Anvil, Grinnell, Victaulic, or approved equal.
- G. Adapter Flanges: Adapter flanges (fittings) shall be cast iron/class 125 conforming to ANSI B16.1, with a rust inhibiting coating. The adapter flanges shall be by Anvil, Grinnell, Victaulic, or approved equal.
- H. Grooved Couplings: Grooved couplings and reducers shall be malleable or ductile iron conforming to ASTM A47. Coupling gasket shall be molded Elastomer (EPDM) per ASTM D2000, Victaulic grade "E" (type A) or approved. On dry pipe systems, use a "FlushSeal" or "Flush Gap" gasket. Grooved couplings and reducers shall be of the same manufacturer as used for the grooved fittings.
- I. Plain End Couplings: No plain end couplings (Roust-A-Bouts, Painless or similar couplings) may be used on either new or existing sprinkler systems.
- J. Hole Cut Outlets, New Systems: No hole cut outlets may be used on new sprinkler systems.
- K. Hole Cut Outlets: Hole cut bolted branch outlets couplings may be used only in isolated locations as approved by the Owner. Hole cut outlets shall be a full-bodied outlet (U-bolt outlets will not be permitted) Style 920 by Victaulic or approved. Coupons created by hole cut outlets shall be secured to the fittings via zip-tie or wire.
- L. Flexible Drops: Flexible drops are allowed on a case by case basis when approved by Owner's Fire Protection Engineer. If flexible drops are used, they must include ceiling system modifications for a complete system.

2.4 HANGERS AND SUPPORTS

- A. Hangers: Provide hangers to support all piping in perfect alignment without sagging or interference, to permit free expansion and contraction, and meet the requirements of NFPA 13.
- B. Pipe Rings: Pipe rings shall be galvanized Tolco Fig. 200 or approved equal. For end of branch line restraint provide Tolco Fig. 25 restrainer or approved equal or approved installation method.
- C. Hanger Rods: Hanger rods shall be zinc or electro-galvanized for dry systems.

- D. C-clamps: Equip all c-clamps (beam clamps) with earthquake retaining straps.
- E. Riser Clamps: Riser clamps shall not protrude more than 2 inches beyond the edge of the hole. The riser clamps need be only UL listed, Tolco Fig. 4/4A or approved equal.
- F. Concrete Anchors: Concrete expansion anchors shall be Hilti, Phillips, Impex, ITW, or approved equal.
- G. Explosive Anchors: Explosive type fasteners are not permitted.

2.5 EARTHQUAKE BRACING

- A. Seismic Bracing Structural Attachments: Seismic brace structural attachments shall be Tolco Fig. 910, Tolco Fig. 980, or approved equal.
- B. Seismic Brace Pipe Attachments: Seismic brace pipe attachments shall be Tolco Fig. 1000, Tolco Fig. 1001, Tolco Fig. 4A, or approved equal.

2.6 VALVES

- A. Outside Screw and Yoke (OSY) Valves: OSY valves shall be cast iron, flanged and rated for 175 psi, non-shock cold water working pressure.
- B. Valves not Permitted: Wafer valves are not permitted, unless specifically listed herein.
- C. Isolation/Control Valves: Sprinkler system, standpipe, and other above ground controlling valves shall be gear-operated slow-close butterfly valves with flag type indicator, ductile iron grooved body, EPDM coated disc, stainless steel stem with bronze bushings, and two internal single-pole, double-throw monitor switches. Use Victaulic Model 705W or approved equal.
- D. Supervised Valves 1-1/2 Inches and Smaller: Sprinkler controlling valves 1-1/2 inches and smaller shall be slow-close supervised butterfly valve from Milwaukee Valve Company, Model BB-SCS02; no exceptions. Valves controlling fire sprinklers in elevator pits shall be unsupervised.
- E. Valves Controlling Sprinklers in Elevator Machine: Control the sprinklers located in elevator machine with a normally closed supervised butterfly control valve from Milwaukee Valve Co., Model BB-S02-R. [***Designer: Consult with EH&S if it is a high-rise building or high-rise building requirements are being applied to this project.***]
- F. Drain Valves: Drain valves need only be UL Listed, screw-in bonnet bronze globe valves, rated to 175 psi non-shock cold water working pressure by Nibco, United or approved substitution. Low point drain valves shall have, in addition, a 3/4-inch brass nipple with a 3/4-inch male hose threads and cap.
- G. Combination Test and Drain Valve: AGF Model 1000 Test 'N Drain assembly; no exception. Pressure gauge for system pressure located on Test 'N Drain assembly is not acceptable for measuring system pressure.

- H. Check Valves: Check valves shall be grooved, iron body, bronze seat, stainless steel clapper with a replaceable rubber seal (a rubber seal integral with the seat is not acceptable), and 175 psi non-shock cold water working pressure. Use Viking Model D, or approved equal.
- I. Backflow Prevention Assemblies: [***Designer: Modify Standard Drawing SD-M-17 as necessary and include in the Contract Documents.***] Provide a double check valve assembly. The assembly shall be listed in the most recent Washington State Department of Health, Drinking Water Program's "Backflow Prevention Assemblies Approved Installation in Washington State". Backflow Prevention Assemblies shall be by Febco, Ames, Watts or approved equal.

2.7 SPRINKLERS

- A. Sprinklers: [***Designer shall modify this section as necessary.***]
 - 1. Provide quick response, glass bulb, ordinary temperature, recessed sprinklers in all finished lay-in or plaster ceilings. [**Provide chrome/white/other sprinklers with a chrome/white/other escutcheon.**] Reliable Model F1FR Recessed, Viking Microfast Model M with escutcheon Model E-1, or approved equal.
 - 2. All other building areas, sprinkler heads shall be quick response, glass bulb, ordinary temperature: Reliable Model F1-FR, Viking Model M, Gem Model A, or approved. Provide upright, pendent, sidewall etc. to meet building conditions.
 - 3. Areas subject to high temperatures exceeding 110 deg F or as noted in NFPA 13 shall have intermediate temperature sprinklers or high temperature sprinklers as required by AHJ. Sprinkler heads shall be quick response in these areas.
 - 4. Provide special purpose, dry sprinklers, concealed, or extended coverage sprinklers only where shown on drawings, or specified herein. [***Designer: Please propose specific products.**]
 - 5. For residential occupancies provide UL Listed Residential Sprinklers manufactured by Reliable or Viking.
- B. Spare sprinklers: Provide spare sprinklers and escutcheons for 10 per cent of each type and style of sprinkler used in accordance with NFPA 13 and proportioned based upon the number of each type and style of sprinkler used on the job. Spares of dry-pendent sprinklers are not required.

2.8 SPARE SPRINKLER CABINET

- A. Provide a spare sprinkler cabinet to accommodate the required number of spare sprinklers and escutcheons. Include a wrench for each type of sprinkler in the cabinet. Paint the cabinet fire red and key to a Corbin Catalog 30 lock. Label the cabinet with a riveted or screwed laminated plastic nameplate indicating "SPARE SPRINKLER CABINET" in white letters on a red background, letters to be 3/4 inch high.

2.9 SPRINKLER HEADGUARD

- A. Provide UL Listed sprinkler headguards for sprinkler heads subject to mechanical damage or for any sprinkler lower than 7'-0" above the floor.

2.10 FIRE DEPARTMENT CONNECTION

- A. **[*Designer: A sign indicating "Auto Sprinkler" or similar shall be provided as a part of the escutcheon or as a separate sign permanently affixed to the building. Lettering for the sign shall be a minimum 1 inch high. Choose either chrome or polished brass for the FDC and escutcheon.*]**
- B. Provide a fire department connection (FDC) with horizontal type connections, dual clapper, 2-1/2 inch inlets, with rocker lug caps, and chains.
- C. Provide a bronze ball drip for the fire department connection (FDC) inside of the building and connect to nearest floor drain.

2.11 ROOF FIRE DEPARTMENT CONNECTION

- A. **[*Designer: Consult with EHS on the requirements for a roof FDC.*]**
- B. Provide a wall type indicator post and butterfly valve for the roof indicator post, with a two-way roof fire department connection with rocker lug caps and chains, Potter-Roemer 5870 series or approved equal.

2.12 POST INDICATOR VALVE

- A. Provide a post indicator valve (PIV) on the fire service water main into the building.

2.13 HOSE VALVE

- A. Provide 2-1/2 inch polished brass hose valves with a cap and chain. Turn the outlet at an angle of 45 degrees from the wall. The cap is to have a 1/8 inch diameter hole drilled in the face to relieve any water pressure. Potter-Roemer Model 4065 with Model 4626 (cap and chain) or approved equal.

2.14 SIGHT DRAIN

- A. Where required, provide a single piece sight drain by Grinnell or approved equal.

2.15 PRESSURE GAUGE

- A. Provide 3-1/2 inch diameter, bourdon type pressure gauge, 0 to 300 lbs, 1/4 inch soft metal seat globe valve with arrangements for draining pipe between gage and valve, located near each main or floor control valve assembly on the main line or near each test location.

2.16 DRUM DRIP

- A. Provide a drum drip per NFPA 13 at the low drain points on a dry system.

2.17 SPLASH BLOCK

- A. Provide a splash block at the point of discharge for the drains outside of the building, if the ground will be disturbed by the flow of water.

2.18 SLEEVES

- A. Provide 24 gauge galvanized sheet metal with lock seam joints or 1/2 inch overlap sleeves in floors, partitions, ceilings, and in construction without waterproof membranes. Provide schedule 40 galvanized steel pipe sleeves in exterior walls. Provide schedule 40 pipe sleeves with clamping rings in slab-on-grade or exterior walls having below grade penetrations. Provide sleeves through roofs with flashing collars.

2.19 LINK SEALS

- A. Provide link seals when underground pipe passes through an exterior wall or slab. Flexible couplings or push-on joints located within 1 foot of each side of the wall must be included in the link seal installation.

2.20 WALL ESCUTCHEON

- A. Provide plastic split ring type escutcheons and paint to match the wall. Escutcheons are only required with exposed pipe installations.

2.21 DRY PIPE ALARM VALVE

- A. **[*Designer: For dry systems only.*]** Provide a dry pipe alarm valve, trim package, accelerator and air maintenance device, all by the same manufacturer.

2.22 AIR COMPRESSOR/AIR MAINTENANCE DEVICE

- A. Provide UL Listed air compressor or maintenance device, sized to completely refill the system within 30 minutes. Compressor: Gast or approved equal. Air maintenance device: Viking Model D-2 or approved equal.
- B. Set the dry pipe system air pressure at the maximum recommended by the information sheet for the dry pipe valve or at 20 psi greater than the standard calculated trip pressure.
 - 1. The PS-40-2 switch setting shall be as follows: The high setting shall be the high calculated value plus 10 psi; the low setting shall be the low calculated value minus 10 psi.
 - 2. For compressors, the start point shall be set at 5 psi below the lowest calculated point.

2.23 FIRE ALARM AND RELATED EQUIPMENT

- A. Equipment in this section shall be provided, installed, and adjusted by the sprinkler contractor. Conduit, wiring, and terminations shall be by Division 28 subcontractor.
 - 1. Waterflow Switch: Potter VSR-F, VSR-SF (smaller pipe diameters); no exceptions.
 - 2. Valve Supervisor Switch: Potter OSYSU-A2 for OSY valves and Potter PIVSU-A for PIV valves; no exceptions. Butterfly isolation valves shall be equipped with two internal single-pole, double-throw monitoring switches.
 - 3. Pressure Type Waterflow Switch: **[*Designer: For dry systems only*]** Potter PS10-2A; no exceptions.
 - 4. High-Low Air Pressure Monitoring Switch: **[*Designer: For dry systems only*]** Potter PS40-2A; no exceptions.
 - 5. Potter bleeder valve BVL; no exceptions
 - 6. Supervised Valves 1-1/2 inches and Smaller: Slow-close Supervised Butterfly valve from Milwaukee Valve Company, Model BB-SCS02; no exceptions.
 - 7. Valves Controlling Sprinklers in Elevator Machine Room: Control the sprinklers located in elevator machine by a normally closed butterfly control valve from Milwaukee Valve Co., Model BB-SC02-R; no exceptions. Note: These valves activate the elevator shunt trip only and are not associated with the fire alarm system.
 - 8. Pipe, fittings, valves, as necessary for installation of electronic bell on the exterior of building. Electronic bell specified in Division 28 Section "Fire Alarm System."

2.24 SIGNS

- A. Provide all control, drain and test valves with signs identifying the type of valve and the area (floor or portion of the building) affected by the valve. Signs shall be three layer etched plastic with red letters on a white background. Letters are to be minimum 1/4 inch high. Submit the wording for approval (for example, "CONTROL VALVE FOURTH FLOOR NORTH"). The signs are to be hung by a chain from the valve. If the system is a calculated system, provide a sign in accordance with NFPA 13.
- B. Signs shall also indicate, especially on dry pipe systems, those valves which should be kept normally open or normally closed.

2.25 FIRESTOPPING MATERIAL

- A. Firestopping material is to be UL classified for wall or floor rating, Bio Fireshield BFS100, 200 caulk or approved equal.

2.26 PIPE THREAD SEALANT

- A. Provide a brush-on pipe thread sealant with Teflon, Grinnell Tuff-Loc or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Requirements Prior to Installation: Do not order, fabricate, or install any material prior to receipt of all approvals as stipulated in Part 1 of this section.
- B. Standards and Requirements: Perform all installation work in accordance with the reference standards without exception, and as required by the AHJ. Install all piping straight, true and plumb.
- C. Changes to the Work: Install all piping as shown on the approved shop drawings. Carefully note any minor deviations on the record drawings as outlined in Part 1 of this Section. Before making significant deviations from the approved drawings, obtain written approval from the Owner's Representative and the AHJ.
- D. Coordination of Work: Carefully coordinate work with other trades so that unnecessary offsets and revisions to the approved drawings are avoided. Failure to coordinate does not relieve Contractor from meeting performance standards.

3.2 SHUTDOWN OF EXISTING SYSTEMS

- A. Any shutdowns of existing water distribution systems, fire sprinkler systems, domestic water systems or fire alarm systems shall be approved by the Owner's Representative. Provide advance written notice at least 14 days prior to the shutdown to the Construction Coordinator.

3.3 PENETRATIONS

- A. Required Clearance around Pipe: Provide piping that passes through fire rated assemblies, including fire rated gypsum wallboard assemblies, with clearance around the entire circumference of the pipe as required by NFPA 13. Penetrations of walls, floors or ceilings shall be made in a neat manner using properly sized hole saw or masonry/concrete coring as necessary.

- B. Fire Rated Assemblies: The annular space between the wall or pipe sleeve and the sprinkler pipe in fire rated assemblies shall be filled with UL classified firestopping material in accordance with the manufacturer's recommendation; also see Articles 2.18 and 2.25.
- C. Escutcheons: Install split wall plates or escutcheons where exposed piping or hangers pass through a finished floor, wall or ceiling, fitting these snugly and securely, and covering the opening.

3.4 CONTROL VALVES

- A. Install all control valves, supply valves and test valves in easily accessible locations, with the valve handle or wheel no higher than 7 feet above the finished floor. **[*Designer: Modify Standard Drawing SD-M-18 (Floor Control Valve Assembly) and include on the Contract Drawings.*]**

3.5 INSPECTOR'S TEST AND DRAINS

- A. Inspector's Test: **[*Designer: Modify this paragraph as necessary.*]**
- B. Provide inspectors test valves for each floor of each system. For dry systems the inspector's test assembly shall be piped to discharge outside the building and shall be located at the hydraulically most remote part of the system. For buildings two stories or less, pipe the inspector's test assembly to discharge outside the building, located at the hydraulically most remote part of the system. For buildings higher than two stories, the inspector's test assembly shall be piped as noted in NFPA 13 (FDI Standard Drawing SD-M-18). Discharge into a drain riser located adjacent to the system riser or into a drain for a remote inspectors test valve when provided, i.e. in dry systems. The valve shall be readily accessible, at a location no higher than 7 feet above finished floor.
- C. Main drains: **[*Designer: Coordinate with the plumbing drawings to indicate the appropriately sized floor funnel drain when required.*]**
- D. Provide main drains at all system and floor control valves. Discharge shall be into drain risers for a multi-story building. Drain risers and main drain for single story buildings shall discharge to a safe location outside the building wherever possible. Provide splash blocks to limit damage to landscaping. Where outside discharge cannot be achieved, discharge shall be to minimum 6 inch floor drain, with a funnel. Do not pipe any sprinkler system drain line directly into a drain; there must be at least a 1/2 inch gap between the pipe and the funnel/drain.
- E. Auxiliary drains: Provide auxiliary drains at all low points of the system, where the trapped section of pipe exceeds 5 gallons.
 - 1. Provide an auxiliary drain for each floor of the building within a building stairwell hydraulically remote from the floor control assembly.
 - 2. The drain shall consist of, as a minimum, a valve, a 3/4 inch brass nipple with a 3/4 inch male hose threads, and cap. Locate auxiliary drains in unfinished areas without suspended ceiling wherever possible. In finished areas, with lathe and plaster or GWB

locate the hose bib within six inches of an access panel, minimum 12 inches by 12 inches.
If located in bathrooms the panel is to be stainless steel.

3.6 GAUGES

- A. Provide gauges at the main system riser and each floor control valve. Tap gauges from the main piping, not from the drain piping. Do not locate gauge on gauge outlet of Test'N Drain assembly.

3.7 LAY-IN CEILINGS

- A. **[*Designer: Modify as required; this shall be the minimum. For lay-in suspended acoustic ceilings, locate sprinklers between the one-quarter and three-quarter points of the tiles in both directions and carefully align them*]**

3.8 EARTHQUAKE BRACING

- A. Install earthquake bracing in accordance with NFPA 13 and as clarified in the Handbook of Automatic Sprinkler Systems.

3.9 INSPECTION, PUNCH LIST AND HYDROSTATIC TESTS

- A. All inspections and acceptance testing involving the fire department shall be scheduled through the Owner's Fire Protection Engineer. Final acceptance shall be granted jointly by the AHJ and the Owner's Fire Protection Engineer or the Owner's Representative. Approval by the AHJ shall be evidenced in writing and forwarded to the Owner.
- B. Flushing of Underground Piping: Flushing shall be considered satisfactorily completed when no debris emanates from the piping or the piping has been flushed for a time period acceptable to the SFD and EH&S representatives. Coordinate with Civil.
- C. Hydrostatic Testing of Underground Piping: Refer to NFPA 24 for permissible leakage in underground piping. The amount of leakage shall be measured by pumping from a calibrated container. The Contractor shall repair any leaks or drips immediately. Do not use additives and corrosive chemicals, sodium silicate or derivatives of sodium silicate, brine, or other corrosive chemicals for testing systems or stopping leaks. Coordinate with Civil.
- D. Hydrostatic Testing of Aboveground Piping: Install above-ground piping in such a manner that there will be no visible leakage or drop in gauge pressure when the system is subjected to the hydrostatic pressure test. Test shall be in conformance with NFPA 13. Contractor shall repair any leaks or drips immediately. Do not use additives and corrosive chemicals, sodium silicate or derivatives of sodium silicate, brine, or other corrosive chemicals for testing systems or stopping leaks.
- E. Inspection of Piping before Installation of Wall/Ceiling Material: Piping, hangers and sway bracing shall be considered satisfactorily installed when the installation is in conformance with

the Contractor's approved shop drawings and NFPA 13. The Owner's Fire Protection Engineer and the Fire Department Representative shall approve any deviations from the approved shop drawings. When, in the opinion of the Owner's Fire Protection Engineer or the Fire Department Representative, the installation deviates greatly from the approved shop drawings, revised shop drawings and hydraulic calculations may be required to verify the installation.

- F. Partial System Test or Sprinkler Coverage Inspections: Perform tests with the sprinklers installed in their final positions. Where it is critical to the continuance of the project as a whole to cover portions of the piping with ceilings or walls prior to the completion of the entire system, perform partial testing of the system after receiving written approval from the Owner's Representative. In this case, "partial" indicates an entire zone or floor of one system. A satisfactory partial test does not relieve Contractor from performing all final testing procedures.
- G. Final Piping Inspection: Final sprinkler head placement shall be considered satisfactorily complete when all sprinkler heads are installed in accordance with their listing or approval and Contractor's approved shop drawings. The Contractor may be required to relocate or add additional sprinkler heads if proper sprinkler coverage is not provided due to unforeseen or modified Owner's conditions.
- H. Final Functional Test: The final functional test shall be considered satisfactorily complete when all valves and switches perform in accordance with the Contractor's approved shop drawings and the following test procedures:
 - 1. Operate all control valves to verify proper operation of the valve and associated tamper switch.
 - 2. Operate all test connections to verify waterflow switch operation.
 - 3. Dry-Pipe System Air Test: Pressurize all dry system piping to 40 psi of air pressure for 24 hours in order to verify leak-tight installation. The piping system shall not allow a loss of pressure over 1-1/2 psi in 24 hours. All leaks resulting in a loss over 1-1/2 psi shall be repaired and the system retested.
 - 4. Dry-Pipe Valve Operation: Operate the dry system inspector's test connection. Record the following information on the Contractor's Material and Test Certificate during the valve operational test: time for valve to operate, time to receive water at inspector's test connection, static supply water pressure, system air pressure and air pressure at valve release. The inspector's test connection shall receive water within 60 seconds of its operation.
 - 5. Pressure Regulating Valves: Flow-test pressure regulating valves (PRVs) to verify proper performance. Use a flow-metering device to properly record water flow rate. Record the following information for each valve and attach to the Contractor's Material and Test Certificate: Inlet and outlet static pressures, inlet and outlet residual pressure and test water flow rate. Operate pressure regulating valves in accordance with the Contractor's approved shop drawings and the manufacturer's pressure/flow curves.
- I. The Owner's Fire Protection Engineer and the Contractor's Test Engineer will witness preliminary inspections and tests. The Owner's Fire Protection Engineer, Contractor's Test Engineer and a representative of the Fire Department will witness final inspections and tests.
- J. Punch List: Should the results of the inspection/test not be satisfactory to the Owner's Fire Protection Engineer, or the Owner's Fire Department representatives, deficiencies will be

recorded on a punch list and delivered to Contractor. Make corrections within two weeks of receipt of the punch list, no exceptions, at the Contractor's expense; a re-inspection/test will be made.

- K. Certificate of Completion: Deliver a completed Contractor's Test and Materials Certificate to the Owner upon satisfactory completion of the work.

END OF SECTION 21 10 00