

**DIVISION 21 - FIRE SUPPRESSION**

**DESIGN CRITERIA**

It is the policy of UC Davis to install fire sprinkler systems in all new construction/facilities. If the building is classified as a pole barn, shed, carport, fence, tank or tower (other "U" occupancies may also fall under this exception) and is less than 4,000 square feet, then sprinklers may not be required. Special conditions may exist that will require sprinkler retrofit for alterations to existing facilities, but each facility will be evaluated on a case-by-case basis. Exceptions to this standard shall only be granted, in writing, by the Associate Vice Chancellor Safety Services

Refer to the UC Davis Fire Prevention Services, Deputy Campus Fire Marshal web site for the latest requirements, such as fire access, inspection, plan review, etc.  
<http://safetyservices.ucdavis.edu/ps/fp>

**FIRE SUPPRESSION**

**21 00 00**

REFERENCED STANDARDS

- NFPA (National Fire Protection Agency) -13, current edition, with California amendments
- NFPA-13D, current edition, with California amendments
- NFPA-13R, current edition, with California amendments
- NFPA-14, current edition, with California amendments
- NFPA-24, current edition, with California amendments

HYDRAULICALLY DESIGNED SYSTEM

All hydraulically designed sprinkler systems shall be provided with a minimum of a ten percent safety margin on either the supply or pressure side of the design graph.

All sprinkler systems shall be designed to provide the appropriate density based upon a hazard occupancy classification specified by NFPA 13. In those cases where NFPA 13 does not specifically identify the hazard occupancy classification, the University of California Davis (UCD) Davis Campus Fire Marshal shall determine the hazard classification.

The water supply requirement for sprinklers only shall be calculated from the density curves in NFPA 13. System piping shall be calculated to satisfy a single-point on the appropriate design curve. It is not necessary to meet all points on the selected curve.

SUBMITTALS

Reference applicable NFPA Standard for required submittal documents. Submittals shall include product data, shop drawings and calculations. Requests for water flow data shall be made to the University's Representative prior to bid.

Data sheets shall include, but not be limited to, the following components:

1. Sprinkler heads and accessories

2. Pipes and fittings
3. Check valves
4. Gauges
5. Alarm flow switches
6. Hangers and supports
7. Fire department connection
8. Control valves including post indicator valves, gate valves, butterfly valves, and globe valves
9. Valve supervisory switches
10. Hose cabinets and sprinkler head cabinets
11. Identification signs
12. CSFM listing numbers (include any tamper alarm supervisory devices)

Shop drawings shall include, but not be limited to, the following information (clearly identify design parameter i.e., hydraulic or pipe schedule):

1. Hydraulic calculations for hydraulically designed systems
2. Complete piping plan
3. Reflected ceiling plan with all areas clearly designated
4. Location and size of all hangers and earthquake bracing
5. Project location
6. Point of compass
7. Ceiling construction
8. Full length cross section
9. Location of fire walls
10. Location of seismic joints
11. Location of partitions
12. Occupancy hazard classification of each area or room
13. Location and size of blank spaces and closets
14. Any questionable small enclosure that no sprinklers are intended to be installed (shall be clearly identified)
15. Water supply information – calculate water available from point of connection with water main, upstream of any cross connection device
16. Other sources of water supply
17. Make, type, number, and nominal orifice size of sprinklers
18. Temperature rating and location of high temperature sprinklers
19. Total area protected by each system on each floor
20. Number of sprinklers on each riser per floor
21. Location of alarm bells
22. Total number of sprinklers on each dry-pipe system, pre-action systems, combined dry-pipe/pre-action system or deluge system
23. Nominal pipe size and cutting lengths or center-to-center dimensions of pipe
24. Location and size of riser nipples
25. Type of fittings, joints, sleeves, and location of all welds and bends

26. Location of all control valves, check valves, drain pipes, test pipes, and their terminals
27. Size and location of hand hose, hose outlets, and related equipment
28. Underground pipe size, length, location, weight, material, point of connection to city main, type of valves and meters, and the depth that the top of the pipe is laid below grade
29. Provisions for flushing – size all drains and test valves to handle maximum water volume
30. Additions to an existing system shall include sufficient depiction of the existing system on the drawings as to make all conditions clear
31. Complete name-plate data
32. Name and address of Contractor
33. California State Contractor's license stamp and the identity of the designer
34. Mounting height of fire department connections
35. Penetrations of rated assemblies shall be fire-stopped. Fire stopping shall be an approved material as described in State Fire Marshal Standard 12-43.1.

Require the following general notes on shop drawings submitted for approval by UC Davis Fire Prevention Services, Deputy Campus Fire Marshal, which shall include the following standard wording:

1. The automatic sprinkler system shall conform to the requirements of the current edition of NFPA 13.
2. Penetrations of rated assemblies shall be fire-stopped. Fire stopping shall be an approved material as described in State Fire Marshal Standard 12-43.1.
3. Installation of the sprinkler system shall not be started until completed plans and specifications (including water supply information and capacity of existing sprinkler system, if any) have been approved by the UC Davis Fire Prevention Services, Deputy Campus Fire Marshal.
4. Approved plans and specifications shall be kept on the job site and made available upon request.
5. At various stages and upon completion, the system must be tested in the presence of the University Fire Prevention Services and/or State Fire Marshal.

Submittals having inaccurate hydraulic calculations, content, which is illegible, incomplete or unclear, will be returned without review or approval.

## MATERIALS

### UNDERGROUND PIPING

See Section 33 11 19 Fire Suppression Utility Water Distribution Piping and 33 11 00 Water Distribution, for requirements on underground piping.

### ABOVE GROUND PIPING

Insulate water-filled supply piping in areas exposed to freezing, such as under eaves, cold rooms, passageways, etc.

Flanged fittings shall be used at above grade exterior locations.

Riser and cross mains shall be steel pipe and joined by welding or by roll grooved pipe and fittings. The minimum nominal wall thickness for roll groove or welded steel pipe and pressures up to 300 psi (20.7 bars) shall be in accordance with Schedule 10 for sizes up to 5 in. (127 mm); 0.134 in. (3.40 mm) for 6 in. (152 mm); and 0.188 in (4.78 mm) for 8 and 10 in. (203 and 254 mm) pipe. The minimum wall thickness for cut groove or threaded pipe shall be in accordance with Schedule 30 [in sizes 8 in. (203 mm) and larger] or Schedule 40 [in sizes less than 8 in. (203 mm)] pipe for pressures up to 300 psi (20.7 bars).

Sprinkler piping shall be American Society for Testing and Materials (ASTM) black steel pipe or ASTM B88 type L copper tube installed in an approved manner.

Risers shall be four-inch minimum pipe size from base of risers through the fittings to cross mains serving the first story.

Connections and fittings shall be threaded, flanged, grooved, or welded. Grooveless clamp or saddle fittings are not acceptable.

Grooved clamp tees and bolted branch outlets shall not exceed one-inch branch size and are subject to inspection prior to attachment of branch piping or sprinklers.

Reducing fittings shall be tapered cast metal products. Where grooved couplings are used, there shall be a separate coupling for each connection to the reducing fitting.

Each sprinkler head shall be connected to supply piping via a threaded branch outlet and by a minimum one-inch to one-half inch threaded reducing fitting.

#### MAIN DRAIN TERMINATION

Comply with applicable and current NFPA codes. The main drain for the fire sprinkler system may be directly routed to the inside or the outside of the building. If the main drain is routed to a drain inside the building it shall be routed to a 4 inch drain pipe that extends a minimum of 12 inches vertically with an air gap. The Plumbing/Mechanical contractor shall provide a 4 inch drain pipe with a 4 inch p-trap and a fixed air gap fitting for the fire sprinkler contractor to tie into with the main drain discharge. If an exterior drain is used, provisions to protect the landscape must be incorporated (i.e. cobblestone, splash pad, etc.) to break up velocity of the drain water. A DI (landscape drain inlet) should be installed near exterior main drain to absorb the drain water. The project Landscape Architect should be advised as to the need to address exterior drain(s) location(s) on the mechanical drawings and landscape drawings.

## VALVES

All valves shall be 175 psi working pressure and Underwriters' Laboratories, Inc. (UL) or Factory Mutual System, Factory Mutual Engineering Corporation (FM) approved.

### Gate Valves:

Four-inch pipe size and larger: OS&Y type, iron body, and bronze mounted. A valve supervisory tamper switch shall be required.

Three-inch pipe size and smaller. OS&Y type, bronze gate with solid wedge; a valve supervisory tamper switch shall be required.

### Angle valves:

Bronze angle valve with screw-in bonnet, internal seat, and renewable disc.

### Globe valves:

Bronze globe valve.

### Check valves:

Iron body, bronze mounted, horizontal swing check valve with bolted bonnet. Check valves shall be designed for replacement of internal parts without removal of valve body from piping. Alarm check valves will not be used. All backflow protection devices shall be approved on the most recent "List of Approved Backflow Prevention Assemblies," USC Foundation for Cross-connection Control and Hydraulic Research.

### Post indicator valves (if required by UCDFPS):

Cast iron, bronze mounted, double disc, non-rising stem gate valve with cast iron body indicator post handle shall be secured with Master 2018 padlock (University standard) and a valve supervisory tamper switch is required. Post indicator valves shall not be installed if the system has a listed indicating control valve located on the riser in a valve room or other accessible location as approved by the University Fire Prevention Services.

### Butterfly valves:

Bronze body, threaded ends, stainless steel disc and stem, two-inch maximum pipe size with integral tamper switch and geared slow close mechanism.

## SPRINKLER HEADS

Sprinkler heads shall be UL listed or FM approved. A target of 165 degrees F for all ordinary temperature classified areas; higher temperature ratings shall be approved in intermediate and high classification areas.

For exterior and corrosive atmospheres, provide wax-coated sprinkler heads. For sleeping rooms, install Quick Response Standard type sprinkler heads.

Nothing in this specification shall prevent submittal of new technology fire sprinkler applications provided these devices are UL or SFM listed and approved.

#### SPRINKLER HEAD GUARDS

Install sprinkler head guards in storerooms and where subject to impact or less than 7 feet above finished floor.

#### GAUGES

Gauges shall be installed on each side of the main check valve and at each test pipe.

Pressure gauges shall be UL listed and labeled 3-1/2 inch dial, liquid filled type, 0-300 psi scale, markings not to exceed 5-psi increments.

Each pressure gauge shall be fitted with a three-way valve and 1/4-inch test gauge connection.

#### SLEEVES AND ESCUTCHEONS

Provide sleeves for all pipes passing through slabs, concrete walls, and partitions. Sleeves shall extend 3 inches above floors and be flush with walls, ceilings, and partitions. In concrete construction, sleeves shall be set in forms prior to pour.

Clearance between sleeves and pipes shall be 1 inch for pipes through 3 and one-half inches, 2 inch for pipe sizes 4 inches and greater, and three inches for seismic joints.

For sleeves set in fire walls and floors, caulk space between pipe and sleeve with flexible, approved fire-resistive packing compound to achieve rating at least equal to that of the wall or floor penetrated. Sleeves in floors on grade or exterior wall below grade shall be packed with oakum between pipe and sleeve, flush with top of sleeve for floors and with outer surface for walls. Sleeves at seismic or expansion joints shall not be packed unless located in a fire wall where piping is routed through fire walls which are seismic or expansion joints. Approved swing joints shall be used, and the sleeves appropriately packed as specified above.

In concrete slabs and walls, schedule 40 black steel pipe shall be used as sleeve material.

Sleeves set in walls and slabs with waterproof membrane may be either cast iron or steel and shall be provided with a flashing clamp device and corrosion resistant clamping bolts.

Furnish and install escutcheons of prime-coated steel set screw for exposed pipes passing through walls, floors, and partitions.

#### FLOW SWITCHES

Provide CSFM listed paddle type flow switches with automatic recycle retard and DPDT contacts.

#### TAMPER SWITCHES

Provide CSFM listed weather-resistant tamper switches on all control valves. PIV switches shall monitor target position. OS&Y switches shall monitor stem movement and shall be complete with J-bolts.

Control valves located on branch lines serving sprinkler protection in elevator spaces shall be provided with a tamper switch. Plug and loop type tamper switches shall not be used to supervise control valves.

#### ALARM BELLS

Provide weatherproof ten inch, 120 VAC electric bell with weatherproof back box. UL or FM approved. Locate on the face of the protected building adjacent to the fire department connection with a mounting height of eight to ten feet above finished grade.

Provide sign directly below the bell. Obtain sign information from the University Fire Prevention Services.

#### HANGERS

Provide in accordance with referenced standards. Do not mix piping material and hanger material of dissimilar metals. All beam clamps shall be fitted with steel retainer straps. Hanger rod of less than 3/8-inch diameter is not permitted.

Sprinkler piping shall be hung with hangers and support independent of any other hanger, support systems or devices. No non-sprinkler materials may be suspended from or attached to sprinkler piping or components.

#### INSTALLATION

##### PIPING

Provide reducing fittings for all changes in pipe size, and provide fittings for all changes in pipe direction. Riser piping shall be installed plumb with offset fittings used where alignment adjustment is necessary.

Provide unions for pipe sizes below 2 inch and flanged or grooved fittings for sized 2 inch and above to permit disconnection of equipment and fixtures.

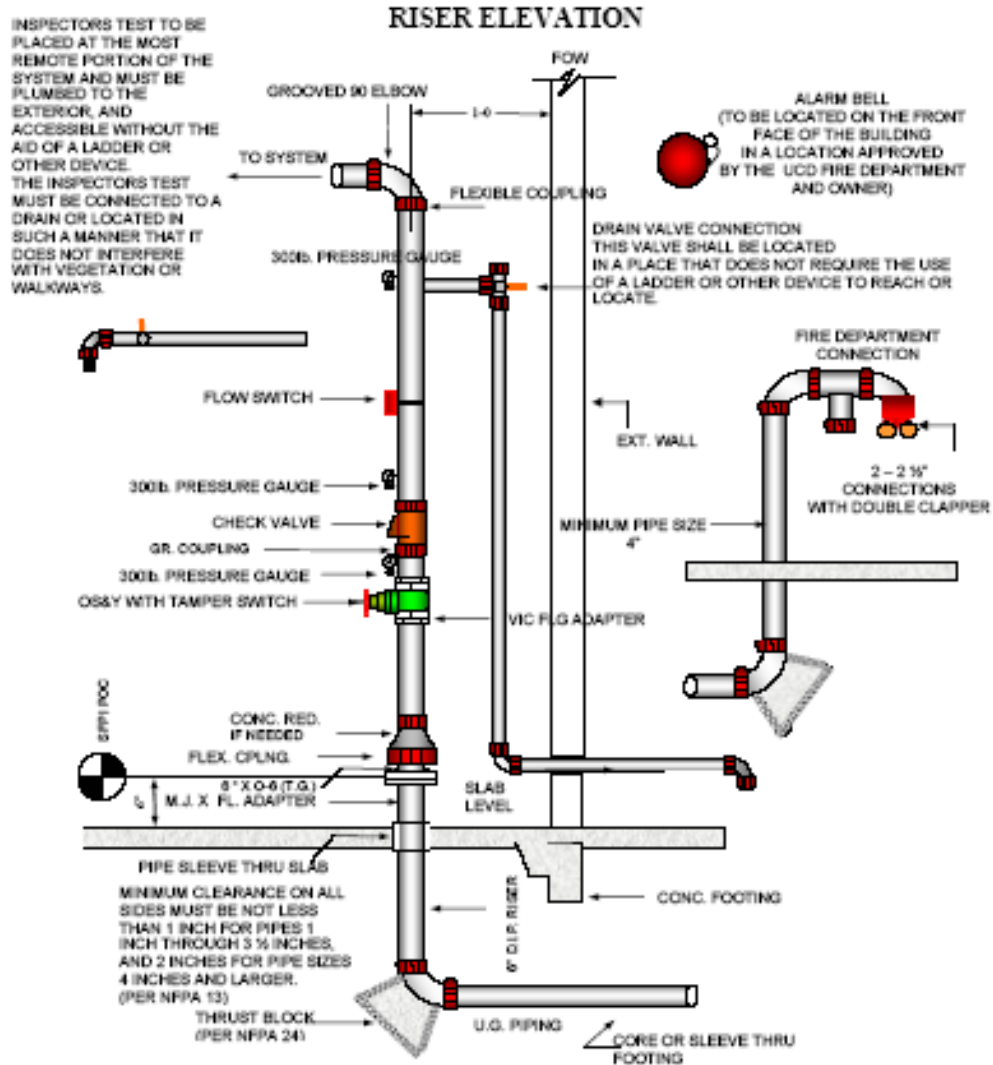
All welded piping shall bear a stamp or imprint of the certified welder and shall be inspected by the University Fire Prevention Services prior to installation. The Contractor shall maintain certified records of welders or fabricators and have available for University Fire Prevention Services review on construction site.

All piping shall be installed to permit thorough drainage.

##### VALVES

Install Inspector's test valves and drain valves in conveniently accessible locations and discharge shall be to the outside of the building or to a drain adequate in capacity to handle the full flow.

The riser shall be arranged as shown in the attached diagram:



**WATERFLOW AND TAMPER SWITCHES**

Install waterflow and tamper switches to monitor fire flow by floor and/or building. Coordinate with University Fire Prevention Services or exact locations as building design and size, multiple systems, fire walls, etc., may impact monitoring requirements.

**INSPECTION AND TESTING**

All tests described and referenced in these standards shall be performed by the Contractor in the presence of the University Fire Preventative Services representative. A minimum of 72 hours notice is required by the University Fire Prevention Services prior to need. Tests and inspections shall apply to all water-source fire protection systems, including fire hydrants, sprinklers, standpipes wet or dry or combination, and all underground piping which supplies these systems and devices.



All piping shall be hydrostatic-pressure tested in accordance with these standards, and the following listed codes and standards:

1. Sprinkler piping: NFPA 13, current edition
2. Standpipes: NFPA 14, current edition
3. Underground piping: NFPA 24, current edition

Systems shall be hydrostatic-pressure tested with installed drops and heads and prior to installation of ceilings or enclosure of sprinkler piping. Inspection of hangers, sway bracing and arrangement of valves and sprinkler heads will be conducted at the start of hydrostatic test, when pipe is filled with water. Adjustment of drops after installed ceilings will not require additional hydrostatic tests.

#### HYDROSTATIC TEST PREPARATION

The following preparations shall be made for hydrostatic testing:

1. Underground, rooftop, and other piping directly exposed to the exterior environment and/or piping containing water absorbent material (e.g., asbestos cement) shall be filled with water 24-hours preceding hydrostatic testing.
2. Interior piping shall be filled with water two hours preceding hydrostatic testing.
3. Piping shall be purged of all air and other gases prior to hydrostatic testing.
4. Underground piping shall be center-loaded and all fittings, joints, strapping and thrust blocking shall be exposed for hydrostatic pressure testing and inspection.
5. All above grade and interior piping, fittings and supports shall be exposed for inspection and hydrostatic testing.
6. Fire department connections and piping shall be included in hydrostatic testing and shall be flushed.
7. Underground mains and supply connections to sprinkler risers shall be flushed thoroughly before connection to sprinkler systems.
8. Test of drainage facilities shall be conducted by opening each drain valve while the system control valves are open to the supply. AU systems will be tested in the presence of the University Fire Prevention Services representative.
9. Water remaining in normally dry piping shall be evacuated at completion of testing.
10. Upon satisfactory completion of all testing and inspections, the Contractor shall certify to the University Fire Prevention Services by submittal of a completed Form 6, "Contractor's Material & Test Certificate for Aboveground Piping" and/or a Form 7, "Contractor's Material & Test Certificate for Underground Piping" immediately upon completion of said test and inspections. Any variation in procedure must be approved in writing by the University Fire Prevention Services.
11. Hydraulic name-plate, required sprinkler spares and wrench with box and other control valve signage and miscellaneous required materials shall be provided prior to acceptance of system.
12. Contractor shall be responsible for coordination of all testing. System shall not be acceptable with uncorrected or unresolved deficiencies. Water damage or associated defects as a result of failure of piping or materials are the responsibility of the Contractor.