

Guideline for the Installation of Underground Piping for Hydrants & Sprinkler Supply Lines

The purpose of this guideline is to provide the basic information necessary to meet minimum requirements for the design and installation of private hydrant and/or sprinkler supply underground piping in accordance with the provisions of the International Fire Code (IFC), the California Fire Code (CFC), California Building Code (CBC), NFPA 13, NFPA 13R, NFPA 24, and locally adopted amendments to these codes. Contact the Fire Department for latest addition and local amendments.

This guideline is applicable to all private underground piping for hydrants and/or sprinkler supply lines. This guideline is not applicable to underground piping serving fire sprinkler systems designed for use in single and multifamily dwellings.

Combustible construction in excess of 150 feet from the street **shall not** commence until the underground and temporary or permanent on-site hydrants are in service and have been tested, flushed and approved by the Fire Department.

In addition, all weather driving surface (paved) access roads shall be installed and approved by the fire department prior to building construction. Every building three (3) stories or more in height shall be provided while undergoing construction, with not less than one (1) standpipe installed in an approved location for fire department use during construction.

1. General

A. Plans for all underground piping for hydrants and/or sprinkler supply line(s) shall be submitted to the fire department for review and approval prior to installation.

B. Submit electronic copies of underground plans and calculations for the proposed underground piping system through the City of Encinitas CSS system.

Note: Some Water Agencies within the jurisdiction require additional sets. Verify plan submittal requirements with the Water Agency prior to submitting.

C. A current (within six months), completed Water Availability form shall accompany plans from the applicable water agency.

2. Information to be provided on the title page

A. Applicable codes and standards used for the system design.

B. Project location, including the full legal address of the facility, and building number(s) if applicable; tract or parcel number.

C. The contractor's name, telephone number, address, and California State contractor's license number and classification. Contractors must possess an, C16, C34, or C36 license or be a registered professional engineer (RPE).

Note: If the piping plan is designed by an RPE, the plan shall contain the name, license number, and classification of the installing contractor, along with the RPE wet stamp. If

this information is not available at the time plans are submitted, proof of compliance with this requirement must be provided to the Fire Department prior to inspection.

3. Additional Required Information

- A. Location and size of public mains:
- B. Requirements for Single-Family Dwellings: In zones other than industrial, commercial, and multi-family, fire hydrants shall be installed in accordance with Table No. 507.5.1.01A.
- C. Table No. 507.5.1.01A
 - Parcels ½ acre and larger: Every 500 feet
 - Parcels less than ½ acre: Every 350 feet
- D. Requirements for Multi-Family, Commercial and Industrial Zones: Fire hydrants shall be installed at intersections, at the beginning radius of cul-de-sacs, or as approved by the fire code official, and every 300 feet of fire access roadways, regardless of parcel size.
- E. Location of all valves. Specify the type and number for each (e.g., post indicator valve (PIV), key gate valve, system control valve, double detector check (DDC), outside stem and yoke (OS&Y), ground control valve, etc.).
- F. PIV's or other approved indicating valves, shall be located a minimum of 40 feet from the building served. Where it is *impractical* to locate control valve(s) 40 feet from the building served, they may be permitted to be located closer utilizing one of the following methods:
 - a. Approved wall mount indicating valves, provided they are located on blank walls (i.e., no openings within 15 feet on either side of the valve and no openings above, clear to the roof).
 - b. Approved indicating valves may be placed in valve rooms accessible only from the exterior. An approved sign shall be provided for the door.
 - c. Approved indicating valves may be placed on exterior risers provided they are located on blank walls (i.e., no openings within 15 feet on either side of the valve and no openings above, clear to the roof).
- E. Specify all Pipe size, class, and type; specify lined or unlined, if applicable.
- F. Thrust block locations, or specify the means of restraint as approved by NFPA 24 or as required by the appropriate agency.
- G. Location of the fire department connection (FDC). FDC's shall be on the address side of building and located immediately adjacent to the approved fire department access road in a position allowing hose lines to be readily and conveniently attached. The fire department connection shall contain a minimum of *two*, 2½" inlets. When the sprinkler density design is 500 gpm or greater (including the interior hose stream demand) or a standpipe system is included, *four*, 2½" inlets shall be provided.
- H. FDC's shall be no more than 100 feet from a public or private hydrant. An FDC may be stand alone or attached directly to the downstream side of the backflow prevention device (see diagram UG-01). The size of piping and the number of inlets shall be approved by the

AHJ as provided for by NFPA 13, and NFPA 24. Fire department inlet connections shall be painted OSHA safety red.

- I. Large service mains shall have post indicating type sectional control valves at appropriate points in order to permit isolation of the system in the event of a break or during repair or extension. *Note: A large system is one with over five connections, including hydrants, to the main.*
- J. At no time shall pipes pass through or under any bearing foundation or footing. All underground piping, fittings and fixtures shall terminate no more than twenty-four inches from any wall footing or structural member and shall rise on the exterior of the structure to be protected. A minimum of 2 inches clearance (interstitial space) shall be provided where the pipe passes through the wall.
- K. The attached "NOTES FOR UNDERGROUND PIPING FOR HYDRANTS AND SPRINKLERS" shall be placed, verbatim, on all underground plans. The attached "NOTES FOR THRUST BLOCK RESTRAINTS" shall be placed, verbatim, on all underground plans that use thrust blocks as the restraining method.

FIRE DEPARTMENT NOTES FOR UNDERGROUND PIPING FOR HYDRANTS & SPRINKLERS

The following items must be included in or with the plan submittals or the plans will be rejected.

PLACE THE FOLLOWING NOTES ON THE PLAN:

1. Installation, inspection, and testing for all underground fire sprinkler supplies shall conform to NFPA 13 and NFPA 24.
2. Back flow prevention shall be installed as required by the appropriate water agency and NFPA Standards 13 and 24.
3. When exposed to possible vehicular damage due to proximity to alleys, driveways, roadways, or parking areas, aboveground back flow device assemblies for fire suppression systems, shall be suitably protected.

NOTE: Guard posts are suitable means of preventing vehicular damage to the above assemblies. Guard posts shall be installed as required by fire department or appropriate water agency.

4. The contractor shall ensure that the appliances are not encroaching in a city or utility company easement area unless approved.
5. Prior to installation, all required permits shall be obtained from the building and water agency having jurisdiction.

6. Provide location of detector check valves.
7. Private hydrants, sprinkler control valves, detector check assemblies, post indicating valves and fire department connections shall be painted OSHA red. Verify with appropriate water agency for backflow painting requirements.
8. All control valves shall be locked in the open position. Valves **shall be** monitored. Control valves **shall be** provided with tamper switches that report to an alarm panel which provides alarm service for structure the water supply services.
9. All sprinkler system control valves **shall** have permanent identification signs and hydraulic data plate.
10. Indicate on plans the location of any hydrants to be installed.
11. Inspections required:
 - a. Excavated trench inspection leaving all elevation changes for valves, pipe, and fitting areas exposed
 - b. Inspection of concrete thrust blocks prior and post pour
 - c. Inspection of all mechanical restraints installed
 - d. Inspection of all corrosion protection in place prior to covering pipe and fittings
 - e. A hydrostatic test (200 psi for two hours or 50 psi over maximum static pressure, whichever is greater) shall be witnessed by an EFD Inspector. The trench shall be back-filled between the joints to prevent movement of the pipe.
 - f. The system shall be thoroughly flushed before connection is made to overhead piping. Flow shall be through a minimum of a 4" hose or pipe unless otherwise approved by the Fire Department inspector. A fire department inspector shall witness the flush.
 - g. All outlets shall be required to be flushed. Sufficient burlap sacks and bailing wire shall be available on site for flush test.
 - h. Flush of all underground piping shall be for period of five (5) minutes or until water is clear prior to connection to fire sprinkler riser. The lines shall be flushed prior to riser hookup. The following flush connections shall be made:
 - 4 inch underground main - one (1) 4" coupling & hose
 - 6 inch underground main - one (1) 4" coupling & hose
 - 8 inch underground main - one (1) 4" coupling & hose lines
 - Larger than 8 inch - Contact the Fire Prevention Bureau for additional requirements

NOTE: The flushing operation shall be of sufficient time to ensure thorough cleaning, THOSE SYSTEMS GREATER THAN 4 INCHES IN DIAMETER SHALL REQUIRE THE USE OF A SINGLE LARGE DIAMETER HOSE. All flushing shall be coordinated with the appropriate Water Authority and in accordance with the appropriate "Storm Water Protection" requirements. This may include dispensing on site or water collection.

12. **Schedule all inspections at a minimum of 24 hours in advance. Inspections canceled after 1 p.m. on the day before the scheduled date will be subject to a re-inspection fee.**
13. **Call the Fire Department Prevention inspection line for scheduling.**
14. Indicate locations of FDC, PIV gate valves and thrust blocks.
15. The FDC shall be located adjacent to the PIV on the system side of the service lines. See PIV and FDC detail UG-01.
16. All piping shall be approved for use in fire service systems (AWWA C900 minimum). DR 25 pipe shall be used where the pressure may exceed 165 PSI.
17. Indicate the size and location of all piping, indicating the class and type of pipe and depth to be buried.
18. Thrust blocks, or other approved method of thrust restraint, shall be provided wherever pipe changes direction.
19. Submit thrust force and soil-bearing calculations in accordance with NFPA 24.
20. Provide the following information obtained from the owner's soils report:
 - a. Lateral bearing capacity of the soil forty-eight inches below grade or at the level on the system piping unless specified on the approved underground plans.
 - a) Corrosive characteristics of the soil in the areas of the system installation.
 - b) Settlement properties of the soil in the areas of the system installation.
 - c) Source of this information.
21. All portions of the underground main (including the FDC) shall be cement lined ductile iron or UL listed plastic. C900 pipe cannot be installed above grade.
22. Underground mains within five (5) feet of building foundations shall be cement lined ductile iron. At no time shall pipes pass under footings unless approved by the Fire Marshal or their representative. Where a riser is close to building foundations, underground fittings of proper design and type shall be used to avoid pipe joints being located in or under the footing or foundation. No mechanical fittings of any kind are permitted under the foundation. (See Diagram UG-01)
23. Underground mains **SHALL NOT** be steel or galvanized steel pipes.

24. All ferrous pipe and fittings shall be protected as per the appropriate water district standards.
25. Tracer tape shall be laid six (6) inches on top of all supply lines to note location depth of pipe
26. A 12" bed of clean fill sand is recommended to be provided below and above the pipe (total 48" of cover).
27. A minimum of 30" of cover, from finish grade to the top of the pipe, shall be provided. When surface loads are expected, a minimum of 36" cover shall be provided.
28. All tie rods, bolts, nuts, etc., underground shall be 316 stainless steel materials.
29. Set screw type flange adapters shall not be used.
30. 1"-3 ½" pipe requires a (2) inch larger diameter hole where the riser passes through a wall. 4" or larger pipe requires a (4) inch larger diameter hole.
31. In all buildings required to have standpipes, the FDC shall be a combination FDC which supplies the fire sprinklers and standpipes.
32. Standpipes shall be provided with fire department hose connections at accessible locations adjacent to usable stairs and the standpipe outlets shall be located adjacent to such usable stairs. Such standpipe systems shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring.
33. The FDC shall be provided with caps, which must be in place immediately after installation.
34. The FDC shall be branded on top in accordance with NFPA 13. In addition, the FDC shall be provided with a permanent sign, made of durable material, indicating the address(s) of the system and type of system it supplies. See example below:

**"THIS FDC SUPPLIES THE BUILDING RISER(S)/STANDPIPE(S) FOR NAME
& ADDRESS OF BUILDING/COMPLEX"**

***NOTE: Manual wet standpipes shall be designated as
"PRIMED DRY STANDPIPE(S)".***

35. All FDC(s) shall have a minimum of two, 2½" inlets with female National Standard Hose threads; all inlets shall be equipped with individual check valves (e.g. clappers). The FDC inlets shall be located at a height of 30 to 36" above finish grade.

36. To determine the number of inlets for the FDC, it shall be assumed that each 2½" FDC inlet will accept 250 gpm. The combined hose requirement (NFPA 13, Table 19.2.2.1) plus sprinkler demand for a calculated system or the maximum acceptable base of riser flow (NFPA 13, Table 19.2.2.1) for a pipe schedule system shall be used to determine the required number of FDC inlets.
37. A two-sided "GREEN DOT" reflective marker shall be installed on the road surface 4" to 6" from center line on the FIRE DEPARTMENT CONNECTION (FDC) side.
38. The color of the FDC and PIV shall be RED.

EXCEPTIONS:

- d) *Architecturally aesthetic installations are not required to be painted, if approved by the AHJ.*
 - e) *When a FDC is located on the backflow preventer it shall be painted "red" with the backflow preventer painted according to water utility standard. The FDC outlets shall be facing the street or as otherwise directed by the AHJ.*
39. The PIV shall be supervised with a supervisory switch and also be locked. The sprinkler company shall arrange for installation of underground conduit for tamper switch wiring to be buried with the underground piping and properly protected to avoid damage prior to the installation of wiring.
 40. The PIV(s) shall be provided with a permanent sign, made of durable material, indicating the address (s) of the system it supplies (e.g., **"THIS PIV SUPPLIES THE BUILDING RISER(S) & SITE HYDRANT(S) FOR NAME & ADDRESS OF BUILDING/COMPLEX"**)
 41. FIRE HYDRANTS AND FIRE FLOWS: The applicant shall provide fire hydrants of a type, number, and location satisfactory to the Fire Department. A letter from the water agency serving the area shall be provided that states the required fire flow are available. Fire hydrants shall be of a bronze type. All outlets shall be provided with National Standard Threads (NST).
 42. Fire hydrant supply piping shall be a minimum of six inches in diameter. The lowest operating nut shall be a minimum of 18" above grade and the hydrant flange height shall be a 4.5" – 7.5" above grade.
 43. Fire hydrants shall be a minimum of 40 feet from all structures and 10 feet away from the return of a driveway.
 44. **Hydrants shall not be installed where walls or other obstructions are located within five (5) feet of the proposed hydrant location.**

45. A keyed gate valve shall be provided for each hydrant in an accessible location. The shut-off valve for the hydrant shall be located no more than 20 feet away from the hydrant and a minimum of 3 feet clearance shall be maintained around the hydrant at all times. **Valves shall not be located in parking stalls.**
46. All hydrants, bollards/guard posts if required shall be installed and painted Osha Safety Yellow unless otherwise specified by the AHJ or appropriate water agency.
47. Horizontal wet standpipe hydrants (on-site "Yard or Wharf" hydrants) shall consist of two 2 ½" indicating valves with fixed hose outlets equipped with caps of frangible metal or brass chained in place. The hydrant shall be capable of four-hour duration while supplying 500 gallons per minute with both outlets flowing. The yard hydrant outlets shall be located at a height of 18 to 24 inches aboveground. All outlets shall be provided with National Standard Threads (NST).
48. Any private fire hydrant located such that an above ground valve (e.g. backflow preventer) can shut it off shall be permanently marked "**VALVE(S) LOCATED AT LOCATION CONTROL(S) THIS HYDRANT.**"
49. On-site hydrants shall be located so that they are within two feet of the curb and so that suction lines will reach from the hydrant to the fire engine (4" pumper connection facing the street or as otherwise directed by the Fire Department's Inspector).
50. A two-sided "BLUE DOT" reflective fire hydrant marker shall be installed on the road surface 4" to 6" from center line on hydrant side. For permanent blue reflective street buttons (Refer to: Caltrans Standard Specifications Section 85) shall be located at the midsection of the access roads, directly in front of the hydrant(s) being added.
51. As per NFPA 13 & 24 a "Contractor's Material and Test Certificate for Underground piping", shall be completed, signed, and delivered to the AHJ prior to clearance for the overhead sprinkler connection.

| Contractor's Material and Test Certificate for Underground Piping | |
|---|--|
| PROCEDURE Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job. A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances. | |
| Property name | Date |
| Property address | |
| Plans | Accepted by approving authorities (names) |
| | Address |
| | Installation conforms to accepted plans <input type="checkbox"/> Yes <input type="checkbox"/> No Equipment used is approved <input type="checkbox"/> Yes <input type="checkbox"/> No If no, state deviations |
| Instructions | Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | Have copies of appropriate instructions and care and maintenance charts been provided to the owner or owner's representative? If no, explain <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Location | Supplies buildings |
| Underground pipes and joints | Pipe types and class <input type="text"/> Type joint <input type="text"/> |
| | Pipe conforms to _____ standard <input type="checkbox"/> Yes <input type="checkbox"/> No Fittings conform to _____ standard <input type="checkbox"/> Yes <input type="checkbox"/> No If no, explain |
| | Joints needing anchorage clamped, strapped, or blocked in accordance with _____ standard <input type="checkbox"/> Yes <input type="checkbox"/> No If no, explain |
| Test description | <p>Flushing: Flow the required rate until water is verified to be clear of debris at outlets such as hydrants and blow-offs. Flush at one of the flow rates as specified in 10.10.2.1.3.</p> <p>Hydrostatic: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi (13.8 bar) or 50 psi (3.4 bar) in excess of the system working pressure, whichever is greater, and shall maintain that pressure ± 5 psi (0.34 bar) for 2 hours.</p> <p>Hydrostatic Testing Allowance: Where additional water is added to the system to maintain the test pressures required by 10.10.2.2.1, the amount of water shall be measured and shall not exceed the limits of the following equation (for metric equation, see 10.10.2.2.6):</p> $L = \frac{SD\sqrt{P}}{148,000}$ <p style="margin-left: 100px;"> L = testing allowance (makeup water), in gallons per hour (gpm) S = length of pipe tested, in feet (m) D = nominal diameter of the pipe, in inches (mm) P = average test pressure during the hydrostatic test, in pounds per square inch (gauge) (bar) </p> |
| Flushing tests | New underground piping flushed according to _____ standard by (company) <input type="checkbox"/> Yes <input type="checkbox"/> No If no, explain |
| | How flushing flow was obtained <input type="checkbox"/> Public water <input type="checkbox"/> Tank or reservoir <input type="checkbox"/> Fire pump Through what type opening <input type="checkbox"/> Hydrant butt <input type="checkbox"/> Open pipe |
| | Lead-ins flushed according to _____ standard by (company) <input type="checkbox"/> Yes <input type="checkbox"/> No If no, explain |
| | How flushing flow was obtained <input type="checkbox"/> Public water <input type="checkbox"/> Tank or reservoir <input type="checkbox"/> Fire pump Through what type opening <input type="checkbox"/> Y connection to flange and spigot <input type="checkbox"/> Open pipe |
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| NFPA 24 (p. 1 of 2) | |

▲ FIGURE 10.10.1 Sample of Contractor's Material and Test Certificate for Underground Piping.

| | | | |
|---|--|---------------|--|
| Hydrostatic test | All new underground piping hydrostatically tested at _____ psi (bar) for _____ hours | | Joints covered <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Leakage test | Total amount of leakage measured _____ gallons (liters) _____ hours | | |
| | Allowable leakage _____ gallons (liters) _____ hours | | |
| Forward flow test of backflow preventer | Forward flow test performed in accordance with 10.10.2.5.2: | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Hydrants | Number installed | Type and make | All operate satisfactorily <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | Water control valves left wide open If no, state reason | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Control valves | Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | Remarks | | |
| Signatures | Date left in service | | |
| | Name of installing contractor | | |
| | Tests witnessed by | | |
| | For property owner (signed) | Title | Date |
| For installing contractor (signed) | Title | Date | |
| Additional explanation and notes | | | |
| <p style="text-align: center;">© 2018 National Fire Protection Association NFPA 24 (p. 2 of 2)</p> | | | |

▲ FIGURE 10.10.1 *Continued*

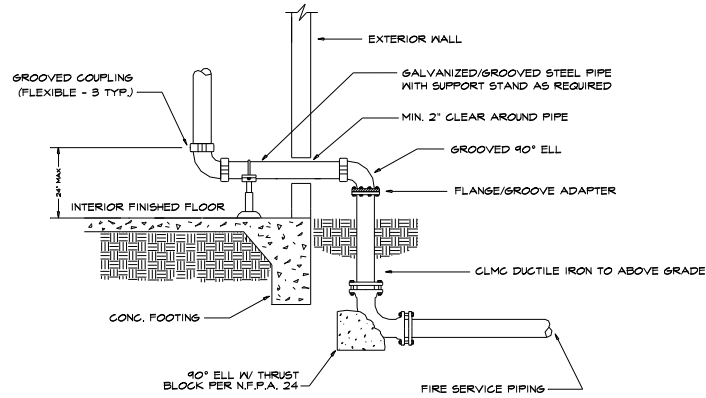
Shaded text = Revisions. ▲ = Text deletions and figure/table revisions. • = Section deletions. N = New material.

Revised 5/5/2023

Diagrams below for reference only and are not to scale, each application may vary and will require Fire Department approval of submitted plans. Note water standards may take precedence.

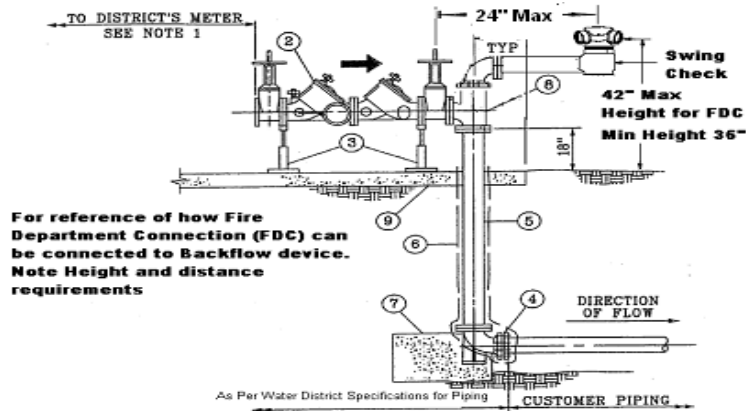
Diagram UG-01

ALL FERROUS AND METALLIC UNDERGROUND PIPE AND FITTINGS SHALL BE PROTECTED WITH CONTINUOUS POLYETHYLENE SLEEVES AND COATED PER N.F.P.A. REQUIREMENTS.

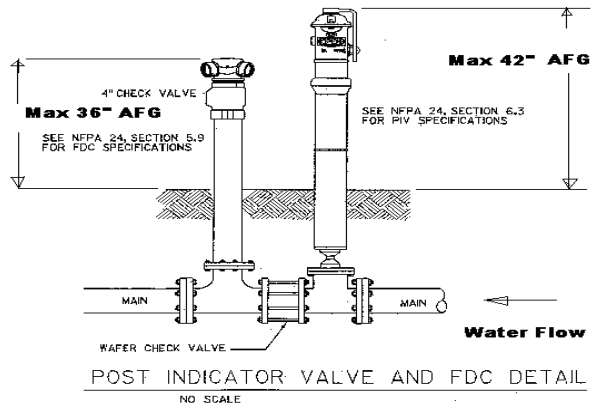


SERVICE ENTRY

NO SCALE



FDC Caps to point in direction that allows fire department access from street. The distance from the center of the valve to the center of the FDC can vary, but needs to be enough distance away to ensure operation of the hand wheel from the FDC,



FDC caps to point in direction to allow for connection that will not interfere with Post Indicating Valve (PIV) operation.