



# Guideline for Private Fire Service Mains

## Purpose & Scope

This guideline is applicable to all private underground piping for hydrants and/or sprinkler supply lines (fire service mains). The design and installation of these private fire service mains must be in accordance with the provisions of the 2022 California Fire Code (CFC), the 2022 California Building Code (CBC), the 2019 edition of National Fire Protection Association (NFPA) 24, the 2022 editions of NFPA 13 and NFPA 13R, and the [City of Oceanside Municipal Code](#).

The purpose of this guide is to provide contractors, designers and installers to navigate the plan review and inspection process and will cover:

1. Submittal requirements
2. Plan Review and Design Requirements
3. Inspection and Install Requirements

## Submittal Requirements

Plans for all private underground piping for private hydrants and/or sprinkler supply line(s) must be submitted to the Oceanside Fire Department (OFD) for review and approval after the Building Permit has been issued.

### How to submit:

- For paper submittals: 3 copies of the submittal
- For digital submittals: Go to our [website here](#)

### What to submit:

- Working plans
- Specification sheets for all material
- Water supply test results (fire-flow)

### Working plans

- Must be in accordance with NFPA 24 Chapter 4, §4.1.3 (working plans) and list all items. (See Reference)
- Must notate applicable codes and standards used for the system design (e.g., 2022 CFC, 2022 CBC, 2019 NFPA 24, etc.)
- Include Contractor's name, telephone number, address, and California State contractor's license number and classification



- Contractors must possess a valid A, C-16, or C-36 license, or be registered as a Professional Engineer (PE)
  - *Note: If the piping plan is designed by a PE, the plan must contain the name, license number, and classification of the installing contractor, along with the PE wet stamp*
- Contractor must possess a valid business license with the City of Oceanside.
- Site plan must include location of test and flow hydrants and point of connection to city main.
- Details must be included of applicable to installations including, but not limited to, risers sweeps, thrust blocks, PIVs, FDCs, OS&Ys, Hydrants, and trenches. ([click here to access our water department's specification sheets](#))

## Specification Sheets

NFPA 24 §4.1.4 requires submittals to include the manufacture's installation instructions of any specially listed equipment, including descriptions, applications and limitations for any devices, piping, or fittings.

## Water Supply Test Results

Submittals must include the complete Fire Flow Test and Report information obtained prior to submittal and that was witnessed by an Oceanside Fire Department and Oceanside Water Department representative.

## Hydraulic Calculations

If private hydrants are installed, a set of hydraulic calculations must be provided for the most remote hydrant to show that the system can deliver sufficient fire-flow as determined in CFC Appendix B.

# Plan Review and Design Requirements

In addition to items required by NFPA 24 §4.1.3 to be on the working plans, below are requirements found in the CFC and the Oceanside Municipal Code for your reference.

## Hydrants

- All water mains which support fire hydrants must be looped as required in the [City of Oceanside Engineering Design Manual](#).
- Private fire hydrants must be listed with a minimum of one 2½" and one 4" outlet for detached single family dwellings.
  - For multifamily and commercial buildings, fire hydrants must be listed with a minimum of two 2½" and one 4" outlet.
  - The 4" outlet must face the fire department access road.
  - All outlets must be provided with National Standard Threads (NST).
  - Private hydrants must be painted OSHA safety red.
- Hydraulic calculations for the most remote fire hydrant must be provided to show compliance with CFC Appendix B (Fire Flow).



- Calculation method must be per NFPA 13.
- A keyed gate valve must be provided for each hydrant in an accessible location.
  - Keyed gate valves must be located within six to twenty feet of the hydrant in an area that is unobstructed and clearly visible. Valves must not be located in parking stalls.
- All fire hydrants must have a “Blue Reflective Pavement Marker” indicating their location.
- If subject to impact, bollards must comply with CFC 312.

## Valves

- PIVs and other approved indicating valves, must be located a minimum of 40 feet from the building served unless otherwise approved by the OFD.

## Sectional Control Valves

- If the fire service main system serves more than five (5) fire appurtenances:
  - Sectional control valves shall be indicating valves
  - Sectional control valves shall be located so that no more than five fire appurtenances are affected by shut-down of any single portion of the fire service main.
  - Each fire hydrant, fire sprinkler system riser and standpipe riser shall be considered a separate fire appurtenance. In-rack sprinkler systems shall not be considered as a separate appurtenance.

## Fire Department Connections (FDCs)

- FDCs must be visible on the address side of the building and located immediately adjacent to the approved fire department access road.
- The FDC must be located 3-4ft above adjacent grade.
- The FDC must contain a minimum of *two* 2½” inlets.
  - When the sprinkler demand is 500 gpm or greater (including the interior hose stream demand) or a standpipe system is included, *four* 2½” inlets must be provided.
  - When the sprinkler system is designed in accordance with NFPA 13R, one 2½” inlet is required.
- FDCs must be located within forty (40) feet of a fire hydrant or other locations as approved by the Fire Code Official.
- FDCs must be no closer than forty (40) feet from the buildings they supply or other locations as approved by the Fire Code Official.
- FDCs may not charge on-site hydrants.
  - Check valves *may* be used to prevent charging of on-site hydrants.
- FDCs and PIVs, must be painted OSHA safety red.
- FDCs, PIVs, and DDCs, must have durable, legible signs clearly indicating the address of the facility they serve or, where appropriate, their function (e.g., “Sectional Valve 1 of 2”). Signs must be securely attached to the device.



- Where pipe passes through holes in platforms, foundations, walls, or floors, the holes shall be sized such that the diameter of the hole is nominally 2 in. larger than the nominal diameter of the pipe will be acceptable for pipe sizes 1 in. Through 3 ½ in., and the clearance provided by a pipe sleeve of nominal diameter 4 in. larger than the nominal diameter of the pipe will be acceptable for pipe sizes 4 in. and larger.

## Restraints

### Thrust Blocks

- Thrust block areas based on 225 PSI and 2,000 PSF soil pressure with 2 ½ feet of cover minimum.
- Thrust block bearing faces must be placed against undisturbed soil, approved compacted backfill, or Class 100-E-100 slurry.
- Thrust blocks must be Class 560-C-3250 concrete, unless specified otherwise.
- Thrust blocks must be engineered using NFPA 24 §A.10.6.1. (See Reference)

### Mechanical

- If not using thrust blocks, or if thrust blocks are not capable of being sized correctly due to site conditions, please include cut sheets of mechanical restraints and indicate on plans that they are being used.

## Inspection and Installer Requirements

The three minimum inspections required for fire service mains are:

1. Pre-pour inspection
2. Hydrostatic testing
3. Flush inspection.

*Please schedule all inspections at least 48 hours in advance. Call OFD at (760) 435-4101.*

### Pre-pour inspection:

- Thrust block excavation must be completed, but thrust blocks must not be poured.
- All pipe must be in place and exposed for visual inspection.
- Pipe must be laid on a minimum six-inch bed of clean sand.
- Trenches must be of a sufficient depth to allow the required cover above pipe.
- All bolted joint accessories shall be cleaned and thoroughly coated with asphalt or other corrosion retarding material after installation.
  - Polyethylene wrapping per AWWA C105-10 is required for all ductile iron fittings.



## Hydrostatic testing:

- Thrust blocks must be in place and visible.
- Pipe must be center-loaded with clean sand to prevent uplift, but all joints must remain exposed.
- The system must be hydrostatically tested at 200 psi (or 50 psi over maximum static pressure, whichever is greater) for a duration of at least two hours, with a maximum of  $\pm 5$  psi change, prior to the arrival of the OFD inspector.
- 6-inch bed of clean fill sand must be provided below the pipe and 12-inches above the pipe. All valves and fittings must be encased with 6 inches of neutral sand.
- Tracer wire and detectable warning tape shall be installed.

## Flush and Final inspection:

- All portions of the underground system must be flushed to remove debris prior to connection to overhead piping or to place fire hydrants in service.
- Flow must be through a minimum of a four-inch hose or pipe.
- Hose or pipe must be restrained to prevent injury and damage.
- Discharged water must be collected or diverted in accordance with applicable SWPPP/NPDES provisions.
- Upon flush inspection or prior to final sprinkler or site inspection, all detector check assemblies, control valves, and fire department connections (FDC) must be clearly labeled with the address served by the device.
- Valves must be locked in the open position with breakaway locks.
- All PIV valves and private hydrants must be painted OSHA safety red.
- Hydrant and FDC caps must be in place.
- Minimum three-foot clearance must be provided around all hydrants and post indicating valves.
  - In addition, minimum three-foot clearance must be provided around the detector check assembly to allow proper operation of the device.
- The front of FDC and the adjacent fire access roadway must be free of any obstructions.
- Vegetation must be selected and maintained in such a manner as to allow immediate location of, and unobstructed access to; all hydrants, control valves, FDCs, and other devices or areas used for firefighting purposes.
- A Contractor's Material and Test Certificate for Underground Piping must be submitted prior to final approval of the fire service main. (See NFPA 24 Figure 10.10.1 for template)



## Reference

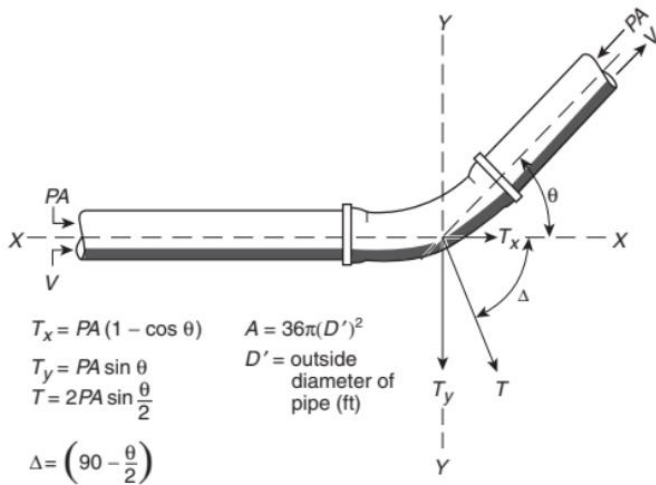
### NFPA 24 §4.3.1 Working plans.

Working plans shall be drawn to an indicated scale on sheets of uniform size, with a plan of each floor as applicable, and shall include the following items that pertain to the design of the system:

1. Name of owner
2. Location, including street address
3. Point of compass
4. A graphic representation of the scale used on all plans
5. Name and address of contractor
6. Size and location of all water supplies
7. Size and location of standpipe risers, hose outlets, hand hose, monitor nozzles, and related equipment
8. The following items that pertain to private fire service mains:
  - a. Size
  - b. Length
  - c. Location
  - d. Weight
  - e. Material
  - f. Point of connection to city main
  - g. Sizes, types, and locations of valves, valve indicators, regulators, meters, and valve pits
  - h. Depth at which the top of the pipe is laid below grade
  - i. Method of restraint
9. The following items that pertain to hydrants:
  - a. Size and location, including size and number of outlets and whether outlets are to be equipped with independent gate valves
  - b. Thread size and coupling adapter specifications if different from NFPA 1963
  - c. Whether hose houses and equipment are to be provided, and by whom
  - d. Static and residual hydrants used in flow
  - e. Method of restraint
10. Size, location, and piping arrangement of fire department connections

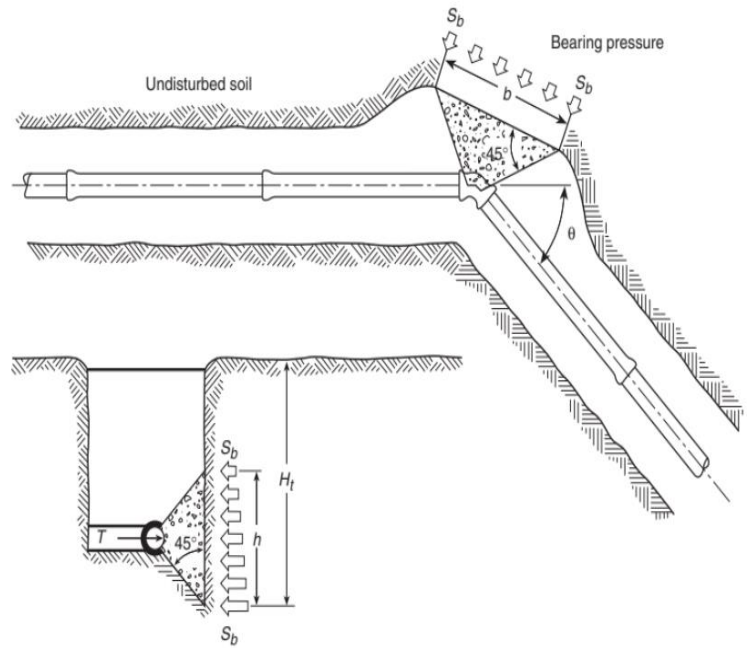
### NFPA 24 §4.1.4 Specification Sheets.

The working plan submittal shall include the manufacturer's installation instructions for any specially listed equipment, including descriptions, applications, and limitations for any devices, piping, or fittings.



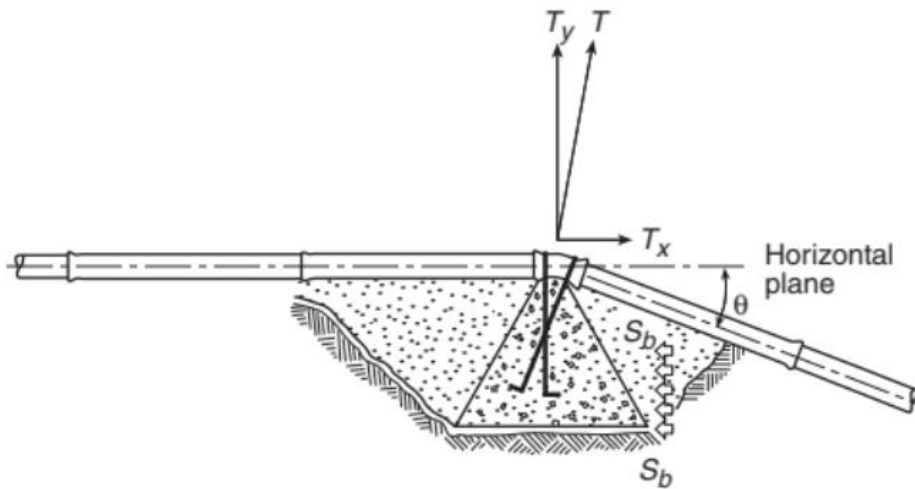
$T$  = thrust force resulting from change in direction of flow (lbf)  
 $T_x$  = component of thrust force acting parallel to original direction of flow (lbf)  
 $T_y$  = component of thrust force acting perpendicular to original direction of flow (lbf)  
 $P$  = water pressure (psi<sup>2</sup>)  
 $A$  = cross-sectional area of pipe based on outside diameter (in.<sup>2</sup>)  
 $V$  = velocity in direction of flow

FIGURE A.10.6.1(a) Thrust Forces Acting on Bend.



$T$  = thrust force resulting from change in direction of flow  
 $S_b$  = horizontal bearing strength of soil  
 $h$  = block height  
 $H_t$  = total depth to bottom of block

FIGURE A.10.6.1(b) Bearing Thrust Block.



$T$  = thrust force resulting from change of direction of flow  
 $T_x$  = horizontal component of thrust force  
 $T_y$  = vertical component of thrust force  
 $S_b$  = horizontal bearing strength of soil

FIGURE A.10.6.1(c) Gravity Thrust Block.