



**SAN MARCOS FIRE DEPARTMENT
FIRE PREVENTION DIVISION**

**STANDARD
NO. 1406**
UPDATED 11/22

UNDERGROUND PRIVATE SERVICE MAINS

Plans

Working plans shall be submitted for approval before any equipment is installed. Plans shall be drawn to an indicating scale on sheets of uniform size. All information of NFPA 24 Section 4.1.3 shall be included on the plans.

Hydrant Requirements

Hydrants shall be of approved type and have not less than a 6 inch diameter connection with the mains.

Commercial / industrial or multifamily fire hydrants shall have two 4 inch ports and one 2 ½ inch port. Distance from one fire hydrant to another in these areas shall not exceed 300 feet from another. Distance from a fire hydrant to the closest Fire Department Connection shall not exceed 50 feet.

Single family residential fire hydrants shall have one 4 inch port and one 2 ½ inch port. Maximum distance from one fire hydrant to another shall not exceed 600 feet.

A fire flow report shall be submitted to the Fire Department for review and to comply with CFC Appendix B.

The tops and nozzle caps of the fire hydrant shall be Color Coded per NFPA 291:

Class AA ([Light Blue Paint](#)) – 1500 GPM or greater

Class A ([Green Paint](#)) – 1000 – 1499 GPM

Class B ([Orange Paint](#)) – 500 – 999 GPM

Class C ([Red Paint](#)) – Less than 500 GPM

The bottom eight inches of a private fire hydrant shall be painted red.

All paint to be utilized shall be from FSC Coatings, Amteco Silicon PolyPlus. (<https://fsccoatings.com>)

Hydrants shall be set on flat stones or concrete slabs and shall be provided with small stones (or the equivalent) placed around the drain to ensure drainage.

A minimum of 3 feet clearance around the fire hydrant shall be provided.

A blue reflective road marker dot shall be installed in the following areas:

Unstriped roadways: Blue marker installed on centerline of road

Undivided stripe roadway: Blue marker 6 inches to the hydrant side of the center strip

Divided roadways: Blue marker shall be set 6 inches to the side of the lane striping closest to the hydrant.



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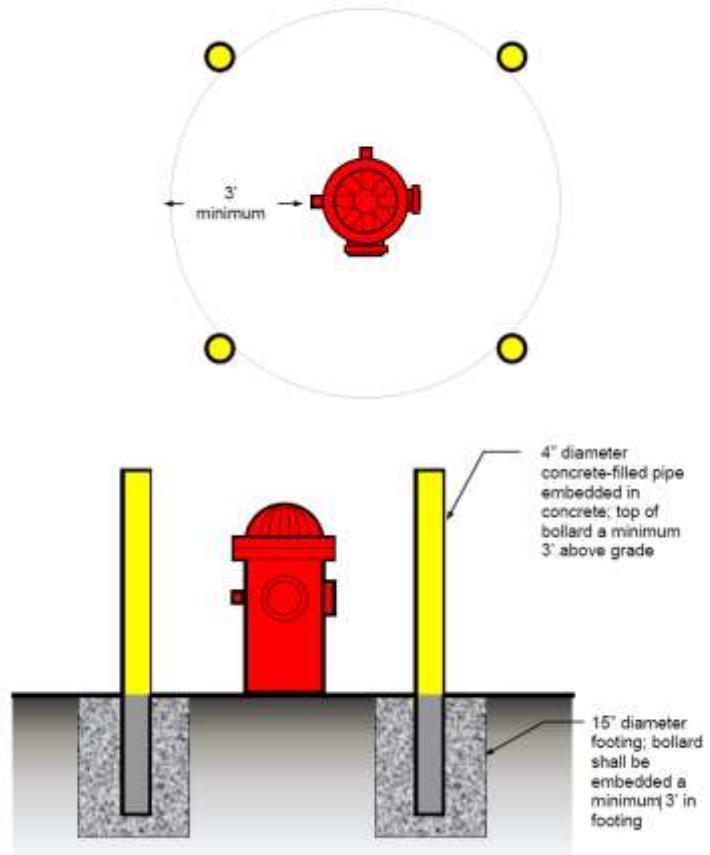
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Hydrants shall be protected if subject to mechanical damage. The means of hydrant protection shall be arranged in a manner that does not interfere with the connection to, or operation of, hydrants.

Protection of Hydrants, Detector Checks, Fire Department Connections, and other Appurtenances





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Fire Department Connection (FDC), Post Indicator Valve (PIV)

Mounting height of any fire department connection either stand alone or attached to the backflow preventer shall be between 36 to 42 inches above grade.

The FDC shall contain a minimum of two 2 ½ inch inlets when the system design demand, including the interior hose stream demand or a standpipe, is a minimum 250 GPM. When the system design demand, including the interior hose stream demand or a standpipe, is a minimum 500 GPM, four 2 ½ inch inlets shall be provided.

Where PIV is used, they shall be set so that the top of the post is 32 to 40 inches above the final grade.

Distance between a PIV and an FDC shall be 5 feet.

All FDC's, PIV's, backflows shall have a durable, legible all weather sign indicating the address of the facility it serves. Refer to SMFD Standard 1403 for sign specifications. Where the system demand pressure exceeds 150 psi the sign shall indicate the required pressure.

Piping, fittings, and other system components shall be rated for the maximum system working pressure to which they are exposed but shall not less than 150 psi.

Vegetation around all fire department equipment shall be approved prior to installation.

Thrust Block Information

Thrust blocks shall be considered satisfactory where soil is suitable for their use.

Thrust blocks shall be of a concrete mix not leaner than one part cement, two and one-half parts sand, and five parts stone.

Thrust blocks shall be placed between undisturbed earth and the fitting to be restrained and shall be capable of such bearing to ensure adequate resistance to the thrust to be encountered.

Wherever possible, thrust blocks shall be placed so that the joints are accessible for repair.

Fire mains utilizing restrained joint systems shall include one or more of the following:

- Locking mechanical or push-on joints
- Mechanical joints utilizing setscrew retainer glands
- Bolted flange joints
- Heat-fused or welded joints
- Pipe clamps and tie rods
- Threaded or grooved joints
- Other approved methods devices

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Pipe & Trench Requirements

Piping must be listed for fire protection service or comply with American Water Works Association standards referenced in NFPA 24.

A 6 inch bed of clean fill sand shall be provided below the pipe and 12 inches above the pipe (total of 18 inches plus outer diameter of the pipe).

Pipe shall be buried at least 36 inches where subject to loading (e.g., driveways, parking lots) and at least 30 inches elsewhere.

Detectable underground warning tape and tracer wire shall be installed.

Electrical conduit shall be installed for OS&Y/Backflow and PIV for tamper switches. Conduit shall comply with California Electrical Code.

Bolted joint accessories shall be cleaned, thoroughly coated with asphalt or other corrosion retarding material and properly wrapped and taped with 10 mil plastic wrap according with NFPA and AWWA C105-10 standards after installation.

Thrust blocks, or another approved method of thrust restraint, shall be provided wherever pipe changes direction.

A minimum 2 inch clearance shall be provided where the pipe passes through slabs or walls. Underground system shall terminate at the riser flange and placed a maximum of 18 inches from an exterior wall and 6 inches above the slab.

Pipe running under a building or building foundation shall be stainless steel and shall not contain mechanical joints.



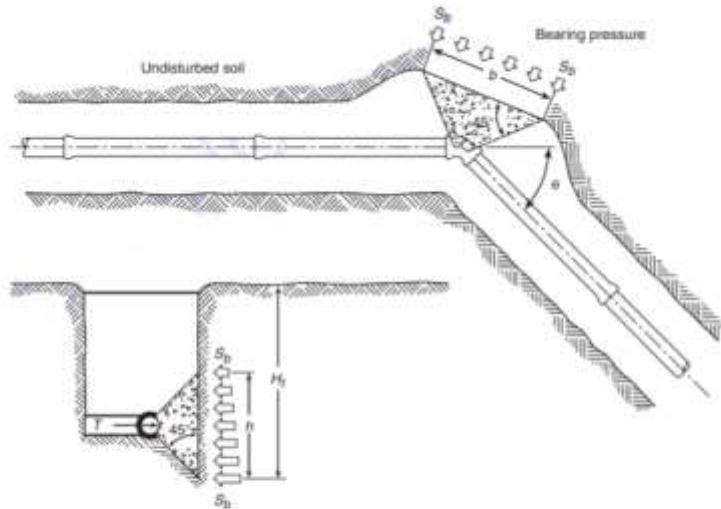
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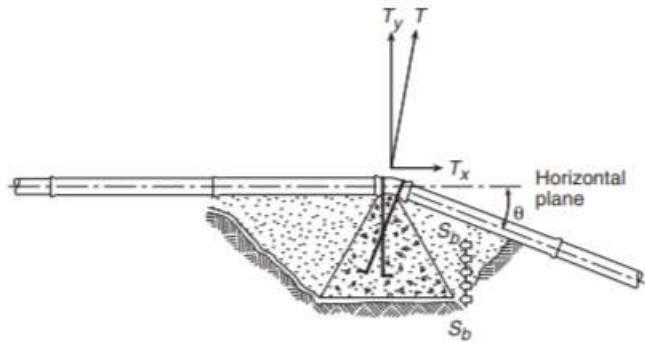
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Thrust Block Details:



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.



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FIG. 1

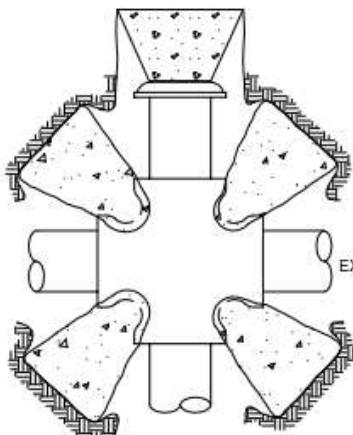


FIG. 2

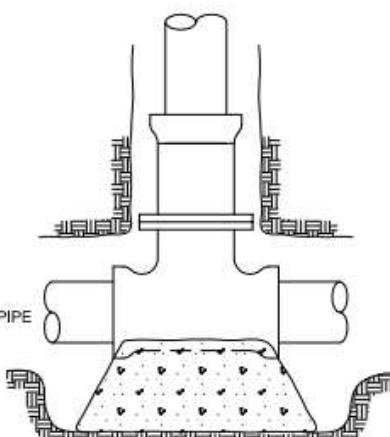
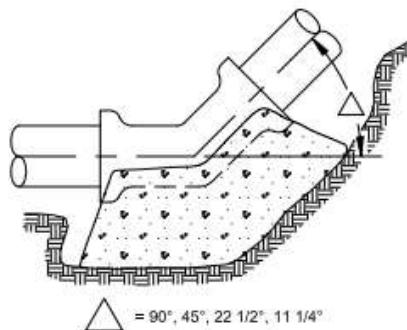


FIG. 3

(HORIZONTAL OR VERTICAL BEND)

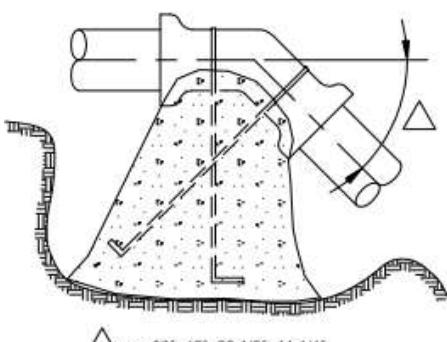


NOTES:

- 1) CONCRETE THRUST BLOCKS SHALL BE CONSTRUCTED IN ALL PIPELINES AT THE LOCATIONS SHOWN HEREON WHERE THE RESPECTIVE FITTINGS AND PLUGS ARE INSTALLED.
- 2) #4 REBAR LOOPS SHALL EXTEND TO THE DEPTH OR WIDTH OF BLOCK. WRAP EXPOSED METAL WITH 10 MIL TAPE PRIOR TO INSTALLATION.
- 3) ALL THRUST BLOCKS TO BE FORMED WITH SAND BAGS.
- 4) FOR CLASS 200 PIPE INCREASE AREAS AND VOLUMES BY 33%.

FIG. 4

(VERTICAL BEND ONLY)

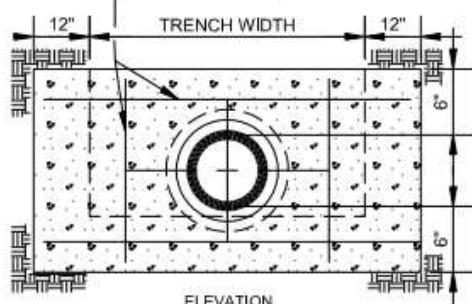
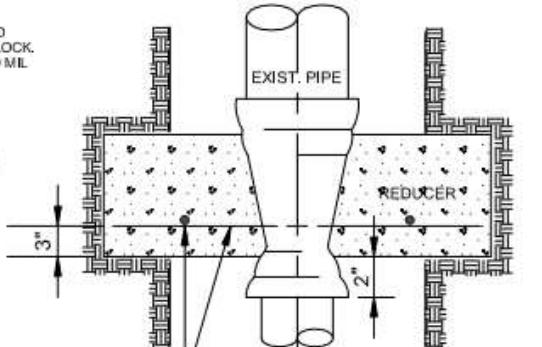


△ = 90°, 45°, 22 1/2°, 11 1/4°

MINIMUMS-SPECIAL DESIGN MAY BE REQUIRED

SIZE OF PIPE	BEARING AREA IN SQUARE FEET				CUBIC FEET			
	FIG 1	FIG 2	FIG 3		FIG 4		#4 RE BAR	TRENCH WIDTH
			90°	45°	22 1/2°	11 1/4°		
CL. 150	CL. 150	CL. 150	CL. 150	CL. 150	CL. 150	CL. 150	#4 RE BAR	TRENCH WIDTH
4"	3	3	4	2	1	1	19	10
6"	5	5	7	4	2	1	-	20
8"	9	9	12	7	3	2	-	-
10"	14	14	20	11	6	3	-	-
12"	20	20	29	16	8	4	-	-
14"	28	28	39	21	11	5	-	-

PLAN





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Inspections Required

A minimum of three fire inspections are required for underground piping serving sprinkler systems and/or private hydrants: 1) Pre-pour inspection; 2) Hydrostatic testing; 3) Flush inspection.

1. Pre-pour inspection: Thrust block excavation shall be completed, but thrust blocks shall not be poured. All pipe shall be in place and exposed for visual inspection. Pipe shall be laid on a minimum 6 inch bed of clean sand. Trenches shall be of a sufficient depth to allow the required cover above the pipe. Ferrous pipe and fittings shall be encased in polyethylene tubing (not wrapped) and tightly taped to inhibit soil infiltration. Ferrous joints shall be coated with asphaltic sealant or other corrosion retarding material.

2. Hydro Testing: Thrust blocks shall be in place. Pipe shall be center-loaded with clean sand to prevent uplift, but all joints shall remain exposed. All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi or 50 psi in excess of the system working pressure, whichever is greater, and shall maintain that pressure at ± 5 psi for 2 hours. Pressure loss shall be determined by a drop in gauge pressure or visual leakage. The test pressure shall be read from one of the following, located at the lowest elevation of the system or the portion of the system being tested: (1) A gauge located at one of the hydrant outlets (2) A gauge located at the lowest point where no hydrants are provided.

3. Flush inspection: All portions of the underground system shall be flushed to remove debris prior to connection to overhead piping. Flow shall be through a minimum of a four-inch hose or pipe, unless otherwise approved by the fire inspector prior to scheduling the flush. Hose or pipe shall be restrained to prevent injury and damage. Discharged water shall be collected or diverted in accordance with applicable SWPPP/NPDES provisions. The flush and hydro inspections may be scheduled concurrently.

NOTE: A Contractor's Material and Test Certificate for Underground Piping shall be submitted to the San Marcos Fire Prevention Division.

NOTE: If restraining pipe per NFPA 24, thrust blocks are not required.