



## Kerrville Fire Marshal

87 Coronado Drive Kerrville, Texas 78028  
Office: (830) 257-8449 Fax: (830) 257-8455



## Section 4

### Fire Sprinkler Underground Submittal

These guidelines are to be followed when a business, facility or organization proposes to install an underground water supply serving an automatic fire sprinkler system, within the City of Kerrville. **These guidelines are not to be interpreted as containing all data required for proper design, installation or approval.**

All fire sprinkler system underground piping for the purposes of this guideline and any other guidelines or requirements of the Fire Marshal shall conform to the *International Fire Code*, as adopted by the City of Kerrville, NFPA 24, City of Kerrville, Texas Standard Specifications and pertinent state and federal laws.

***This guide does not replace, nor supersede any codes and/or ordinances adopted by the City of Kerrville, or determinations and positions of the Fire Chief or Fire Marshal.***

#### General Plan Requirements

1. All underground fire main lines shall begin at the point of connection to the underground circulating public/private water main. A valve shall be provided at the point of connection such that the fire sprinkler underground service line can be isolated from public/private water distribution system.
2. Underground fire main piping shall have a 10 foot minimum separation from all other utilities and placed in a separate trench. Underground piping within 5 feet of the building may be combined with other utilities for entrance into the building.
3. Underground water lines, including fire mains, closer than 9 feet to or crossing over or under a sewer line, shall be installed in accordance with TCEQ requirements and per Section 312.04 of the *City of Kerrville, Texas Standard Specifications for Subdivision Construction*.
4. All underground lines shall terminate at the top of the spigot piece no more than 5 ft. inside the building.
5. All ductile iron, retaining rods, and other non-plastic components shall be externally coated for corrosion and poly-wrapped.
6. A Plan Review Application must accompany all submittals. Submittals will not be approved without an application.
7. All underground piping shall be a minimum of DR14 200 PSI rated pipe or greater.
8. Fire Department connections (FDC) shall be a separate and independent service main from the underground water line.
9. A single point for FDC's shall be provided for buildings with multiple risers.
10. Systems must be designed with a 10 psi safety factor margin with a 20 psi residual on all city mains.
11. The installation street address must be provided for each separate underground line being permitted and installed.
12. The designer and company of record are responsible for the entire system to be installed.
13. Civil construction drawings approved by the City of Kerrville Engineering Department shall not constitute approval of the underground line(s).
14. **No equipment or piping shall be installed PRIOR TO approval of plans and issuance of permit(s).**

#### Submittal Requirements

1. A completed Kerrville Fire Marshal's "Fire Protection Plan Review Permit Application"
2. Copy of Contractors Texas Department of Insurance License
3. Copy of Contractor's Liability Insurance with the City of Kerrville as the certificate holder.
4. An Underground or General RME ("WET") signature and stamp is required on all plan drawings.
5. Plans and specifications/cut sheets shall be submitted in PDF Format into the online platform. A second set of plans shall be submitted on paper at the request of AHJ if needed. Plans shall contain sufficient detail to enable the plan reviewer to accomplish a complete review.
6. Plans shall include:
  - a. Project name.
  - b. Project address.
  - c. Installing contractor's company name
  - d. Installing contractor's complete address
  - e. A scaled copy of the **approved** Site Plan that indicates the location of all fire hydrants and fire lanes servicing the building or site. The size and type of building shall be clearly indicated on the plan.
  - f. Size and location of all water supplies and/or water lines servicing the building or site.
  - g. Flow test data, provided by the Kerrville Fire Marshal and witnessed by a representative shall be shown on the plans.
  - h. Size and type of all piping identified on the plans.
  - i. Occupancy classification.
  - j. Construction type.
  - k. Location of all valves.
  - l. Location and size of all thrust blocks.
  - m. Thrust block details.
  - n. Detail of the spigot piece and/or and in-building riser turn.
  - o. Embedment detail. *See Figure 1.*
  - p. Embedment material shall be No. 4 crushed stone.
  - q. Depth of bury: Minimum is 36 inches, maximum is 60 inches, measured from the top of pipe to finished grade.
  - r. Pit/vault/valve arrangement (if provided with a pit/vault).
  - s. Type of fittings/joints, methods of connection and rod size.
  - t. Location and type of Fire Department Connection (FDC).
  - u. Manufacturer's data sheets for all components used in the project including manufacturer's parameters and listing organizations approval.
  - v. Location and type of backflow prevention.
  - w. Provide information on the transition stability of different types of piping (e.g. transition from PVC to ductile iron, retainer glands).

### **General Requirements**

7. Plans approved by the Kerrville Fire Marshal's Office give authorization for construction and/or operation. Final approvals are subject to field verification. Any approval issued by the Fire Marshal's Office does not release the contractor or property owner from the responsibility of full compliance with all applicable codes, ordinances, standards and state and federal laws relating to the construction project.
8. Installation, fabrication or otherwise construction of the system is prohibited without approved plans and permit.
9. All installations and/or operations must concur with the approved plans. Any deviation from the approved plans requires a re-submittal to the Fire Marshal's Office.
10. All fire department inspection forms and permits shall be kept in a permit packet on the job site until final inspection.
11. Faxed or e-mailed submittals will not be accepted unless authorized in advance by the Fire Marshal.
12. Submittals that do not conform to the minimum above requirements will not be approved.

### **IMPORTANT INSPECTION INFORMATION**

13. All underground piping shall be installed with the manufacturer's label facing up, visible from above the trench.
14. Visual inspection of the installation shall be performed **PRIOR TO** cover. If the piping and joints are covered prior to inspection, or the pipe label is not visible, you will be required to uncover the piping for inspection, regardless of cover. **NO EXCEPTIONS.**
15. Both the underground fire mains, FDCs and aboveground fire sprinkler system(s) piping must be flushed in accordance with the requirements of *NFPA 13* and *NFPA 24*. Flushing of the systems must be witnessed and approved by the Fire Inspector **PRIOR TO** connecting ("stacking") any underground fire main or FDC system to any aboveground piping riser.
16. Hydrostatic test and flush of the fire sprinkler underground lines shall be required at the same time the visual inspection is performed. **NO EXCEPTIONS.** The piping will be allowed to be center loaded to prevent pipe movement.
17. All underground fire mains connected to any City water utility line must be disinfected and pass bacteriological testing in conformance with *City of Kerrville Standard Specifications Section 821.03* (See "*Disinfection of Potable Water Lines*" under following Standard Details) **prior to be connected to a City utility main.**

#### **Standard Details**

18. See attached pages for standard detail sets.
19. All standard details can be provided in PDF file format for incorporation into your submittal drawings.

#### *City of Kerrville Standard Specifications*

*Section 821.03 Disinfection of Potable Water Lines: the Contractor shall protect all piping materials from contamination during storage, handling and installation. Prior to disinfection, the pipeline interior shall be clean, dry and unobstructed. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work.*

*Water for the Work shall be metered and furnished by the Contractor. However, fees for water usage will be waived on Capital Improvement Projects.*

*The Contractor, at his expense, will supply the test gauges and the Sodium hypochlorite conforming to ANSI/AWWA B300, which contains approximately 5 percent to fifteen percent available chlorine. Calcium Hypochlorite conforming to AWSI/AWWA B300, which contains approximately 65 percent available chlorine by weight, may be used in granular form or in 5g tablets for 16" diameter or smaller lines.*

*During construction, granules or tablets shall be placed in the pipe for disinfection. Water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system.*

- A. *Procedure and Dosage: Connection to the existing system will be allowed with a valve arranged to prevent the strong disinfecting dosage from flowing back into the existing water supply piping. The valve shall be kept closed. No other connection shall be made until the disinfection of the new line is complete and the water samples have met the established criteria. The valve shall remain closed at all times. The new pipeline shall not be filled by opening the valve to the existing system. The new pipeline shall be filled completely by using an existing service or by installing a new service. Regardless of the method used, a backflow prevention device shall be installed. Every part of the line shall contain a minimum concentration of 500 ppm available chlorine.*

*The disinfecting solution shall be retained in the piping for at least 24 hours and all valves, hydrants, services, stubs, etc. shall be operated so as to disinfect all their parts. After this retention period, the water shall contain no less than 25 parts per million chlorine throughout the treated section of the pipeline.*

*The heavily chlorinated water shall then be carefully flushed from the potable water line until the chlorine concentration is no higher than the residual generally prevailing in the existing distribution system or approximately one part per million. Proper planning and appropriate preparations in handling, diluting, if necessary, and disposing of this strong chlorine solution is necessary to insure there is no injury or damage to the public, the water system or the environment. Additionally, an authorized representative of the City must witness the flushing.*

*Approval for discharge of the diluted chlorine water or heavily chlorinated water into the wastewater system must be obtained from the Water and Wastewater Utility Department. The line flushing operations shall be regulated by the Contractor so as not to overload the wastewater system or cause damage to the odor feed systems at the lift stations.*

B. *Bacteriological Testing:* After final flushing of the strong disinfecting solution, water samples from the line will be tested for bacteriological quality by the city and must be found free of coliform organisms before the pipeline may be placed in service. One test sample will be drawn from the end of the main and additional samples will be collected at intervals of not more than 1000 feet along the pipeline. All stubs shall be tested before connections are made to existing systems.

*The Contractor, at its expense, shall install sufficient sampling taps at proper locations along the pipeline. Each sampling tap shall consist of a standard corporation cock installed in the line and extended with a copper tubing gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.*

*Samples for bacteriological analysis will only be collected from suitable sampling taps in sterile bottles treated with sodium thiosulfate. Samples shall not be drawn from hoses, fire hydrants or unregulated sources. The City, at its expense, will furnish the sterile sample bottles and collect the test samples. Testing fees will be paid by the Contractor at the time of sampling.*

*If the initial disinfection fails to produce acceptable sample test results, the disinfection procedure shall be repeated. Before the piping may be placed in service, satisfactory test results must be obtained.*

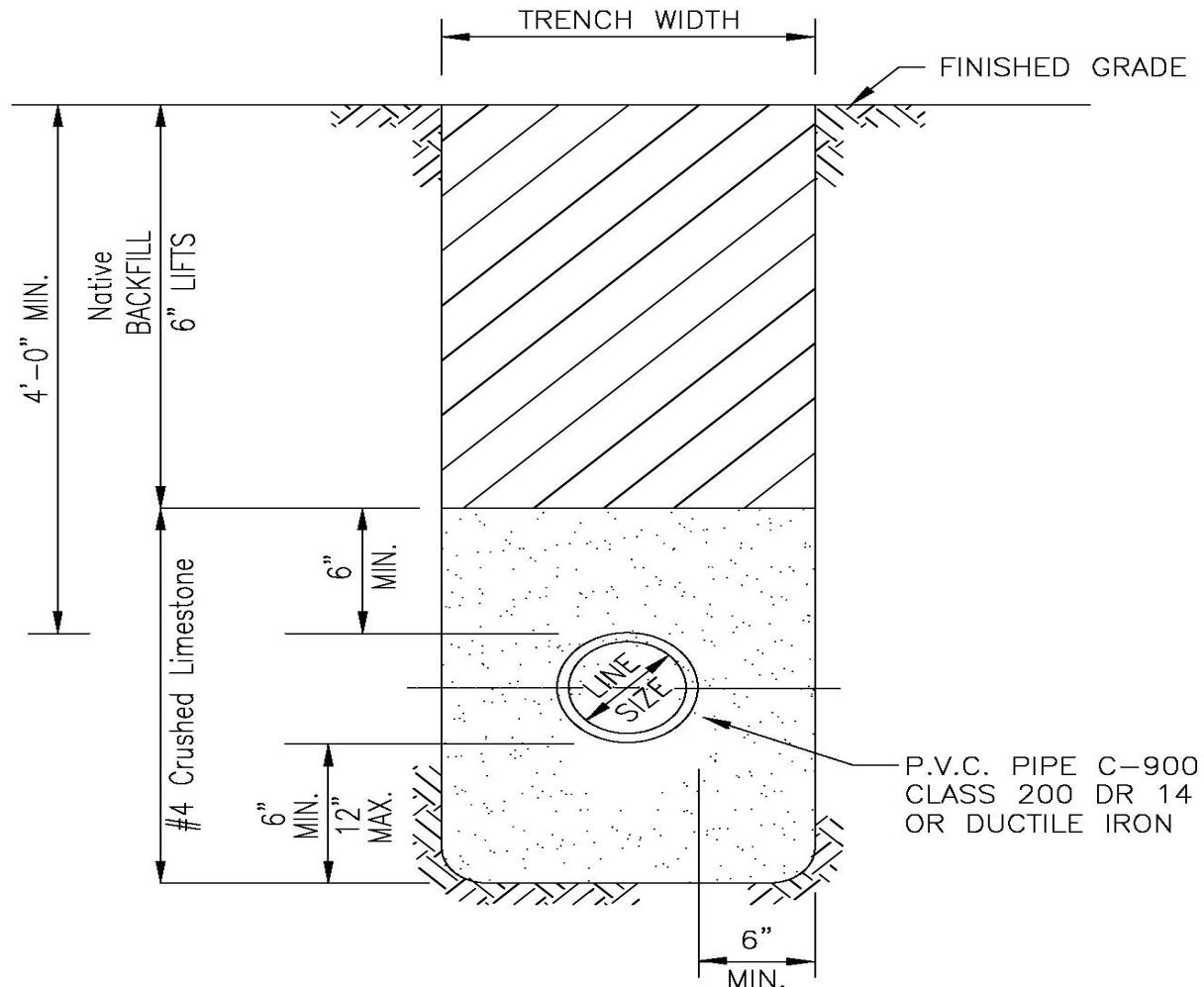
*An acceptable test sample is one which: (1) the chlorine level is similar to the level of the existing distribution system; (2) There is no free chlorine and (3) the total coliform count is zero. An invalid sample is one, which has excessive free chlorine, silt or non-coliform growth. If invalid sample results are obtained from any pipe, the Contractor may, with the concurrence of the Inspector, flush the line and then collect a second series of test samples for testing by the City. After this flushing sequence is completed, any pipe with one or more failed samples must be disinfected again in accordance with the approved disinfecting procedure followed by appropriate sampling and testing of the water.*

*The City of Kerrville Laboratory will notify the assigned City of Kerrville Inspector in writing of all test results. The inspector will subsequently notify the Contractor of all test results. The Laboratory will not release test results directly to the Contractor.*

**Standard Details**

Embedment Detail

Figure 1



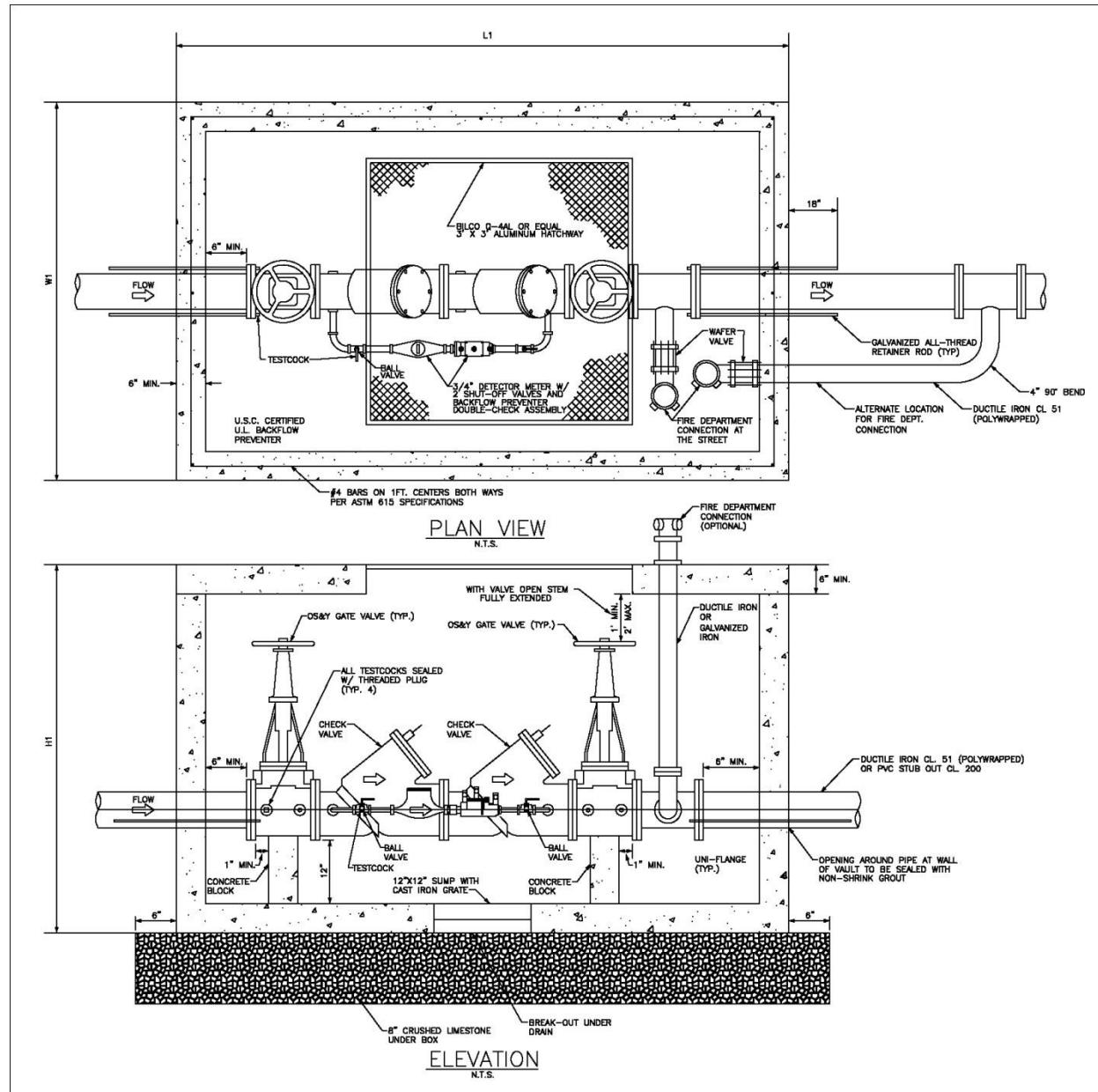
## EMBEDMENT DETAIL & BACKFILL

N.T.S.

## Standard Details

### Backflow Preventor Vault Detail

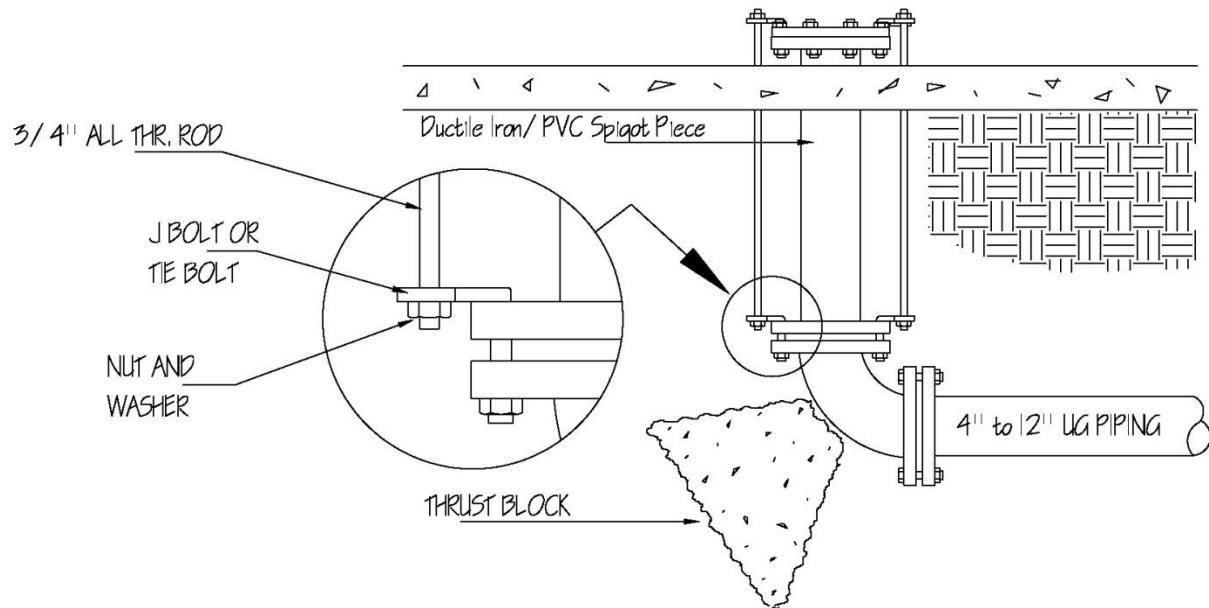
Figure 2



### Standard Details

Spigot Detail  
Figure 3

Note: Set Face of Flange Spigot a Min. of 0'-6" to Max of 1'-0" A.F.F.  
and Center a Min. of 1'-6" to a Max. of 5'-0" Inside Finish Wall

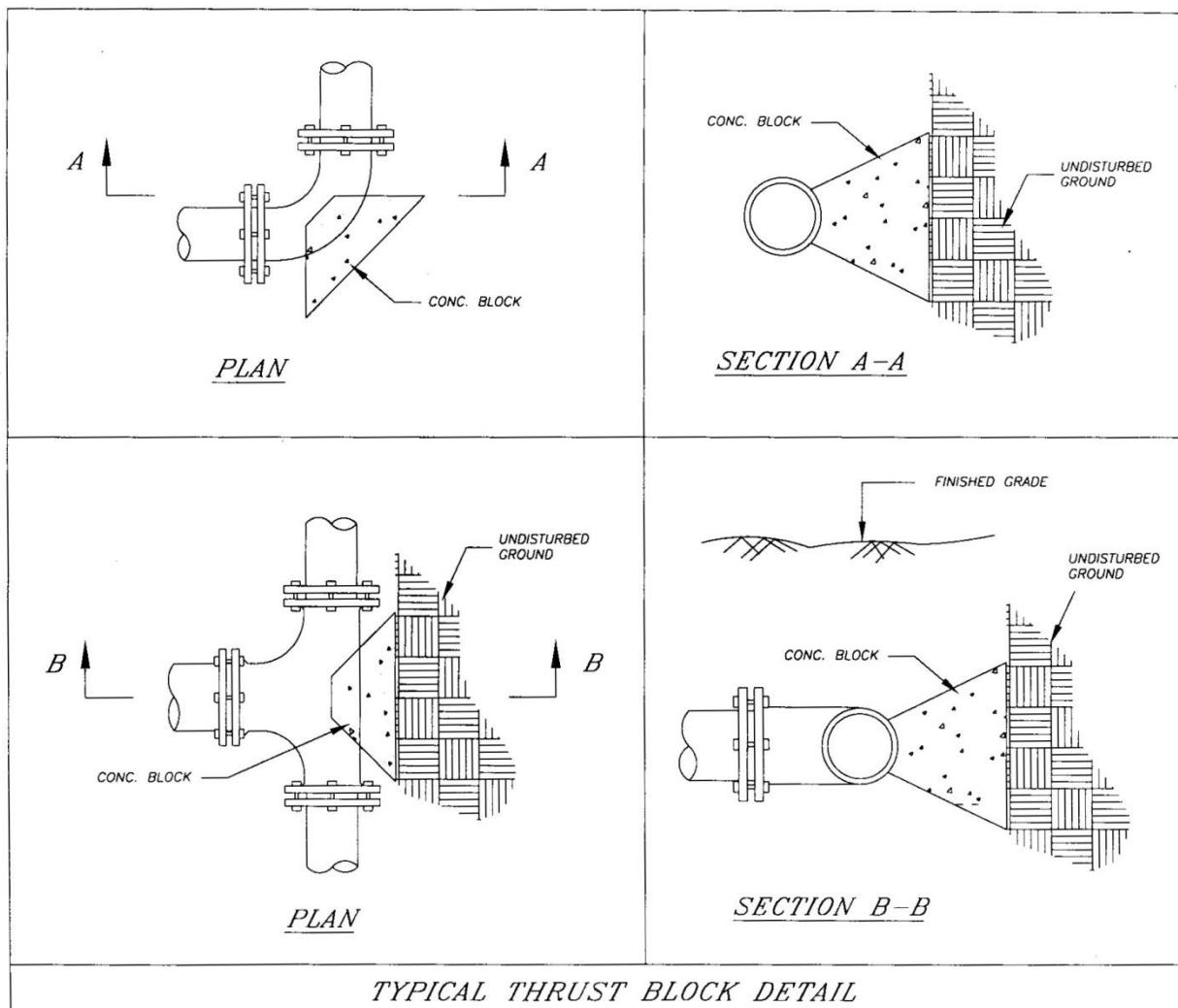


Spigot Detail

**Standard Details**

Thrust Block Details

Figure 4



**Standard Details**

## Thrust Block Sizing Charts

Figure 5

Table A.10.8.2(a) Thrust at Fittings at 100 psi (6.9 bar) Water Pressure for Ductile Iron and PVC Pipe

Nominal Pipe Diameter (in.)	Total Pounds					
	Dead End	90 Degree Bend	45 Degree Bend	22 1/2 Degree Bend	11 1/4 Degree Bend	5 1/8 Degree Bend
4	1,810	2,559	1,385	706	355	162
6	3,739	5,288	2,862	1,459	733	334
8	6,433	9,097	4,923	2,510	1,261	575
10	9,677	13,685	7,406	3,776	1,897	865
12	13,685	19,353	10,474	5,340	2,683	1,224
14	18,385	26,001	14,072	7,174	3,604	1,644
16	23,779	33,628	18,199	9,278	4,661	2,126
18	29,865	42,235	22,858	11,653	5,855	2,670
20	36,644	51,822	28,046	14,298	7,183	3,277
24	52,279	73,934	40,013	20,398	10,249	4,675
30	80,425	113,738	61,554	31,380	15,766	7,191
36	115,209	162,931	88,177	44,952	22,585	10,302
42	155,528	219,950	119,036	60,684	30,489	13,907
48	202,683	286,637	155,127	79,083	39,733	18,124

Notes: (1) For SI units, 1 lb = 0.454 kg. (2) To determine thrust at pressure other than 100 psi (6.9 bar), multiply the thrust obtained in the table by the ratio of the

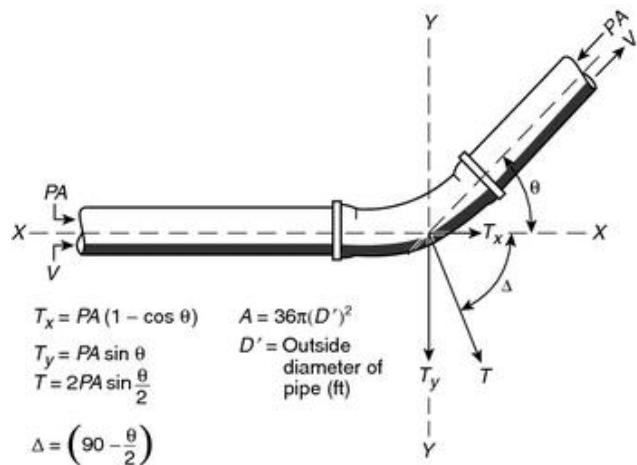
Table A.10.8.2(b) Horizontal Bearing Strengths

Soil	Bearing Strength ( $S_b$ )	
	lb/ft <sup>2</sup>	kN/m <sup>2</sup>
Muck	0	0
Soft clay	1000	47.9
Silt	1500	71.8
Sandy silt	3000	143.6
Sand	4000	191.5
Sand clay	6000	287.3
Hard clay	9000	430.9

Note: Although the bearing strength values in this table have been used successfully in the design of thrust blocks and is considered to be conservative, their accuracy is totally dependent on accurate soil identification and evaluation. The ultimate responsibility for selecting the proper bearing strength of a particular soil type must rest with the design engineer.

**Standard Details****Thrust Block Details**

Figure 6



$T$  = Thrust force resulting from change in direction of flow (lbf)

$T_x$  = Component of the thrust force acting parallel to the original direction of flow (lbf)

$T_y$  = Component of the thrust force acting perpendicular to the original direction of flow (lbf)

$P$  = Water pressure (psi<sup>2</sup>)

$A$  = Cross-sectional area of the pipe based on outside diameter (in.<sup>2</sup>)

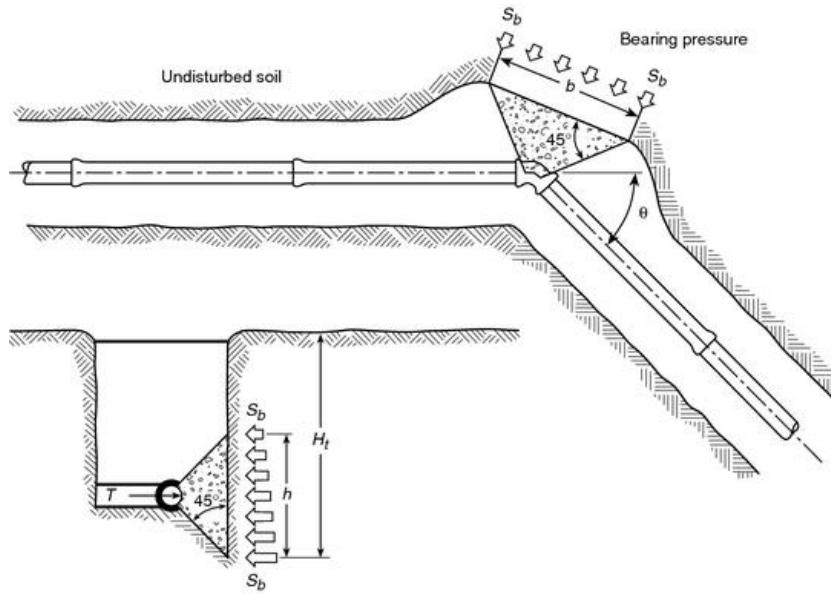
$V$  = Velocity in direction of flow

**FIGURE A.10.8.2 (a) Thrust Forces Acting on a Bend.**

## Standard Details

### Thrust Block Details

Figure 6



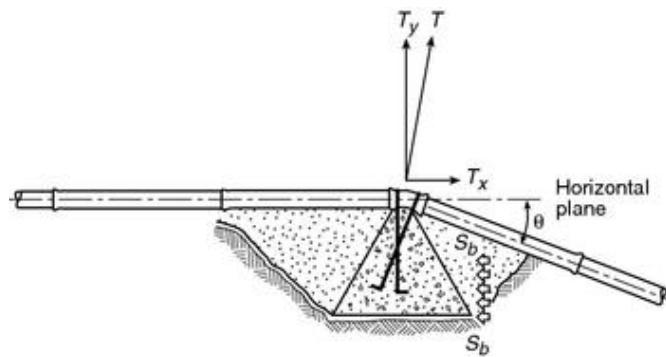
$T$  = thrust force resulting from the change in direction of flow

$S_b$  = horizontal bearing strength of the soil

$h$  = block height

$H_t$  = total depth to bottom of block

**FIGURE A.10.8.2 (b) Bearing Thrust Block.**



$T$  = thrust force resulting from the change of direction of flow

$T_x$  = horizontal component of the thrust force

$T_y$  = vertical component of the thrust force

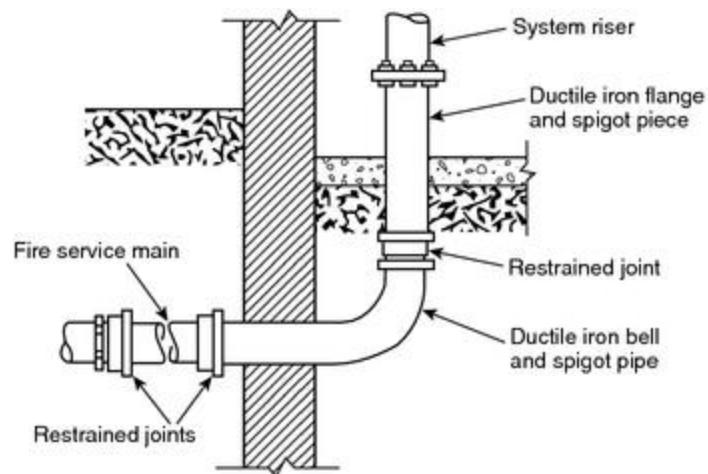
$S_b$  = horizontal bearing strength of the soil

**FIGURE A.10.8.2(c) Gravity Thrust Block.**

**Standard Details**

**Thrust Block Details**

Figure 6



**FIGURE A.10.8.3 Typical Connection to a Fire Protection System Riser Illustrating Restrained Joints.**