

**SECTION 02240  
ANCHORAGE**

I. DESIGN

A. Push-On Joints

All restrained joints by ductile iron pipe and fittings sizes 4-inch to 24-inch in diameter shall be boltless restrained utilizing Field Lok™ or Fast Grip gaskets or approved equal. All gaskets shall be Tyton or Fast Tite joint in design with corrosion resistant stainless steel locking teeth vulcanized into the rubber. All restraining gaskets sizes 4-inches to 12-inches in diameter shall be functional for 350 psi operating pressure with a 2:1 safety factor and allowed for complete joint deflection of 5 degrees. All restraining gaskets sizes 14-inch to 24-inch in diameter shall be functional for 250 psi operating pressure with a 2:1 safety factor and allowed for complete joint deflection of 3 degrees.

RESTRAINED PIPE LENGTH  
(FEET)

PIPE SIZE (INCHES)	TEE* BRANCH	90 ELBOW	45 ELBOW	22 ½ ELBOW	11 ¼ ELBOW	DEAD ENDS
4	0	15	6	3	2	20
6	9	22	9	4	2	28
8	18	27	11	5	3	37
10	25	33	14	7	3	44
12	33	39	16	8	4	52
14	41	44	18	9	4	60
16	48	50	21	10	5	68
18	56	55	23	11	5	75
20	63	61	25	12	6	82
24	77	71	29	14	7	96
30	97	86	36	17	8	116
36	116	100	41	20	10	135

\* One full length (18') of pipe on both sides of branch shall be restrained.

Lengths in table include factors for the use of polyethylene wrapped ductile iron pipe.

B. Thrust Blocking

Reaction blocking shall be designed for a minimum internal pipe pressure of 150 psi pounds per square inch. The blocking shall be kept clear of the entire bell configuration of any adjacent joint and shall be at least as large as is necessary to restrain the fittings from movement.

All plugs, caps, tee, bends, and 16" valves or larger, unless otherwise specified, shall be provided with reaction backing, or suitably restrained by attaching metal rods, clamps, or restrained joints as shown or specified by VCU Supervision. Field Lok™ gasket system or approved equal shall prevail for concrete blocking for 4" through 12" pipe.

For typical thrust block design and installations see Figure 6 of this Specification.

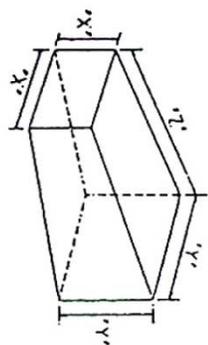
Backing shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that calculated by using Figure 6. The backing shall, unless otherwise shown or directed, be so located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.

Concrete shall consist of an aggregate not to exceed 1 inch with the slump of the concrete when placed not to exceed 3 inches, and have a crushing strength of not less than 2000 psi in 28 days. Admixtures shall not be used except under strict methods of control.

Reinforcement bars shall be of deformed type and shall be billet or rail steel complying with ASTM Specifications A615. All bars shall be bent cold. Before being installed in final position, all metal reinforcements shall be free from mud, clay, ice, grease, oil, loose rust and scale, and other coatings, which would reduce or destroy the bond. Metal reinforcement shall be accurately positioned as to location and size, as called for on drawings.

END OF SECTION

# THRUST BLOCKING

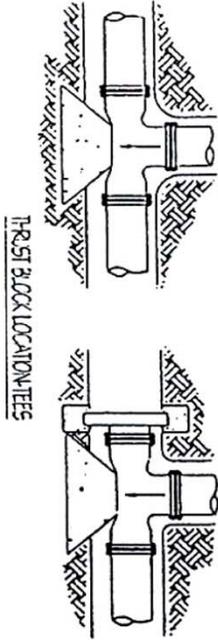


NOTE:

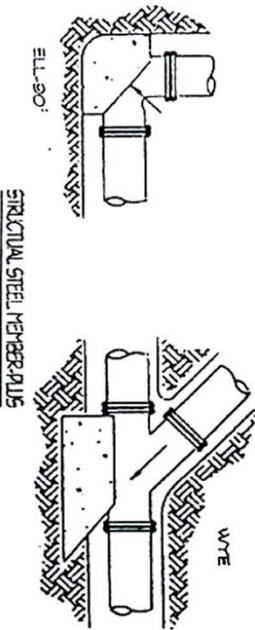
Concrete shall be kept a sufficient distance from joints for removal of all joint accessories including bolts, and shall be of a mix not leaner than 1 part cement to 2 1/2 parts sand and 5 parts stone and having a compressive strength of not less than 2000 psi after 28 days.

Polyethylene installed between fitting and the trust

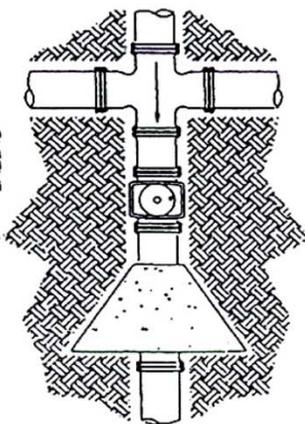
PIPE SIZE:	BEND:	THRUST @ CAPACITY:	BEARING CAPACITY:	REQ'D AREA SQ. FT.:	SIZE OF CONC BUTTRESS:	YDS. OF CONC.:
6'	90°	6400#	1000 PSF	6.40	X=2'-6" Y=3'-0" Z=3'-0"	0.80
	45°	3500#		3.50	3'-0" 2'-6" 2'-6"	0.47
	11.25°	900#		0.90	1'-6" 1'-6" 2'-0"	0.12
8'	90°	11,500#	1000 PSF	11.50	X=3'-0" Y=3'-6" Z=4'-0"	1.54
	45°	6200#		6.20	1'-6" 3'-0" 4'-0"	0.84
	11.25°	3200#		3.20	1'-6" 2'-3" 3'-3"	0.43
12'	90°	26,000#	1000 PSF	26.00	X=4'-0" Y=5'-0" Z=4'-0"	3.50
	45°	15,000#		15.00	3'-0" 4'-3" 4'-0"	2.02
	11.25°	7100#		7.10	2'-0" 3'-3" 2'-6"	0.96
16'	90°	42,000#	1000 PSF	42.00	X=4'-0" Y=7'-0" Z=4'-6"	5.65
	45°	25,000#		25.00	3'-9" 5'-6" 4'-0"	3.36
	11.25°	13,000#		13.00	3'-0" 3'-0" 3'-0"	1.75
20'	90°	65,000#	1000 PSF	65.00	X=6'-8" Y=8'-6" Z=4'-3"	8.73
	45°	38,000#		38.00	5'-0" 6'-6" 4'-3"	5.10
	11.25°	19,000#		19.00	3'-0" 5'-0" 4'-0"	2.56
36'	90°	200,000#	1000 PSF	200.00	X=8'-0" Y=16'-0" Z=7'-3"	26.90
	45°	130,000#		130.00	5'-0" 12'-0" 5'-6"	17.50
	11.25°	60,000#		60.00	4'-0" 8'-6" 5'-0"	8.20
	22.5°	29,000#		29.00	4'-0" 6'-0" 5'-0"	3.70



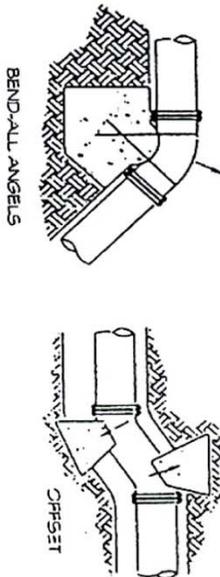
THRUST BLOCK LOCATIONS



STRUCTURAL STEEL MEMBERS



SLEEVE



BEND-ALL ANGLES

OFFSET

FIGURE 6