

Thrust Blocking at Fittings & Valves

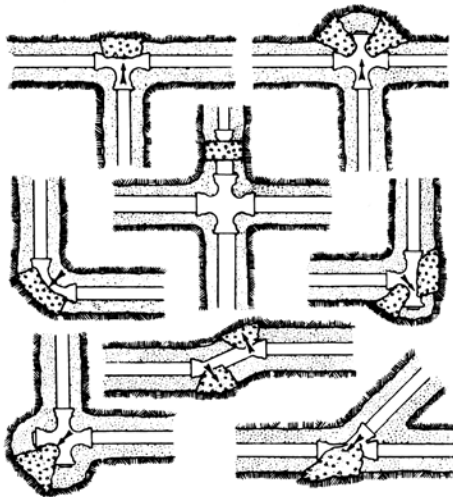
Thrust Blocking

Before the development of Mechanical Joint Restraint Systems, (See Section B) the only established method for preventing joint separation at bends, tees, crosses and valves was by "Thrust Blocking" the fitting.

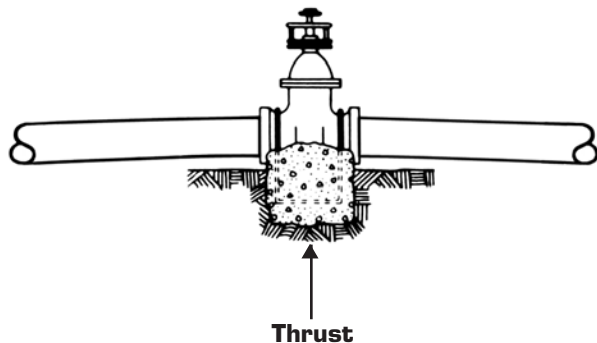
Although seldom used today we include this information on Thrust Blocking design as one of several proven methods of resisting thrust in varying soil conditions.

Determining Size and Type of Thrust Blocking

Size and type of the thrust block depends on maximum pressure, pipe size, kinds of soil and types of fittings.



If thrusts due to high pressure are expected, anchor the valves as shown below. At vertical bends anchor to resist upward thrusts.



The following table shows the approximate thrust generated at fittings for each 100 psi of water pressure.

THRUST AT FITTINGS IN POUNDS AT 100 LBS. PER SQUARE INCH WATER PRESSURE.

PIPE SIZE (INCHES)	90° BEND	45° BEND	VALVES, TEES AND DEAD ENDS
4"	2,600	1,420	1,850
6"	5,400	2,900	3,800
8"	9,300	5,000	6,500
10"	13,900	7,550	10,850
12"	19,700	10,800	13,900
16"	34,000	18,600	24,200
20"	52,200	28,400	37,000
24"	74,300	40,400	52,700
30"	114,100	62,000	80,800
36"	163,400	88,700	115,600

If size of thrust block has not been specified by engineer, the following example shows steps required to determine the bearing area.

Assume thrust block is resisting horizontal thrust at an 8", 90° bend; pipeline to be tested at 200 psi and the soil is sand.

- Check the above table and you will find that the thrust developed on an 8", 90° bend is 9300 lbs. for each 100 lbs. of water pressure. Since the pipeline is to be tested at 200 psi, the total thrust is 2 x 9300 or 18,600 lbs.
- In the table below, you will find that the bearing power of sand is 2000 lbs. per square foot. Dividing the total force of 18,600 lbs. by 2000 lbs., gives a total required thrust backing of 9.3 square feet or an area slightly over 3 ft. x 3 ft.

SAFE BEARING LOAD	
TYPE OF SOIL	LBS. PER SQ. FT.
Muck, Peat, etc.	0
Soft Clay	1,000
Sand	2,000
Sand and Gravel	3,000
Sand and Gravel Cemented with Clay	4,000
Hard Pan	10,000

Caution: While often used in construction, EJP assumes no responsibility for the above bearing load data. The engineer is responsible for determining safe bearing loads and when doubt exists, soil bearing tests should be specified. The bearing loads given are for horizontal thrusts when depth of cover exceeds 2 ft.