



PIPE SIZE	TEES, CAPS, & PLUGS		90° BENDS		ALTERNATIVE RESTRAINED LENGTH IN ALL DIRECTIONS (FEET) - SEE NOTE 5	
	MIN. CONCRETE VOL. (YD;)	MIN. BEARING AREA (FT ²)	MIN. CONCRETE VOL. (YD;)	MIN. BEARING AREA (FT ²)	TEES	90° BENDS
4"	0.1	1.7	0.1	2.4	11	16
6"	0.2	3.5	0.4	4.9	15	23
8"	0.5	6.0	0.9	8.5	20	30
10"	1.0	9.1	1.7	12.8	24	37
12"	1.7	12.8	2.9	18.1	29	44
14"	2.6	17.2	4.5	24.4	33	50
16"	3.9	22.3	6.6	31.5	38	57
18"	5.5	28.0	9.2	39.6	42	63
20"	7.5	34.4	12.5	48.6	47	70
24"	12.7	49.0	21.4	69.3	56	83

SMALL ANGLE ADJUSTMENT FOR ANGLES LESS THAN 90° MULTIPLY VOLUMES, AREAS, AND LENGTHS FOR 90° ANGLE BY THIS FACTOR	
ANGLE	FACTOR
45°	0.414
22-1/2°	0.199
11-1/4°	0.098

NOTES

- CENTER OF MASS OF THRUST BLOCK MUST LAY OPPOSITE TO AND ALIGNED AGAINST THE DIRECTION OF THRUST.
- THRUST BLOCKS SHALL BE POURED SO THAT JOINTS OF FITTINGS, INCLUDING ALL NUTS AND FOLLOWERS REMAIN ACCESSIBLE.
- CONCRETE THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED EARTH. UNSTABLE OR UNSUITABLE MATERIALS SHALL BE REMOVED, REPLACED AND/OR COMPACTED AS DETERMINED BY THE ENGINEER.
- VOLUME AND BEARING SURFACE OF 2500 P.S.I. CONCRETE THRUST BLOCKS ARE BASED ON 150 P.S.I. WATER PRESSURE AND SOIL BEARING CAPACITY OF 2000 P.S.F. ALL OTHER PRESSURE AND/OR SOIL CONDITIONS ARE SUBJECT TO THE ENGINEER'S REVIEW AND APPROVAL.
- THRUST BLOCKS MAY BE OMITTED IF ALL JOINTS WITHIN MINIMUM DISTANCE GIVEN BY ABOVE TABLE ARE RESTRAINED AND PIPE IS BEDDED IN SAND. THE DISTANCES APPEARING IN THE TABLE ASSUME THAT THE PIPE IS BURIED AT LEAST 5' DEEP AND THAT SOIL CONDITIONS ARE AS LISTED IN NOTE 4. THE INFORMATION IN THE TABLE IS BASED ON DIPRA'S "THRUST RESTRAINT FOR DUCTILE IRON PIPE" WHICH SHOULD BE CONSULTED IF THESE ASSUMPTIONS ARE NOT MET. SUBJECT TO THE CONDITIONS LISTED IN NOTE 4, A COMBINATION OF A SMALLER THRUST BLOCK AND A REDUCED LENGTH OF RESTRAINED PIPE IS ALLOWED PER THE FOLLOWING FORMULA:

$$\text{ACTUAL BEARING AREA OF BLOCK} + \frac{\text{ACTUAL RESTRAINED LENGTH OF PIPE}}{\text{RESTRAINED LENGTH REQUIRED BY TABLE}} \geq 1.1$$
- THRUST BLOCKS ARE REQUIRED FOR ALL BENDS, TEES, PLUGS, AND CAPS IN PIPE 4" AND LARGER EXCEPT AS LISTED IN NOTE 5.
- REGARDLESS OF SIZE OF THRUST BLOCKS ALL JOINTS AT CAPS, PLUGS, BENDS, AND TEES MUST BE RESTRAINED.
- RESTRAINED LENGTHS USED IN PLACE OF THRUST BLOCKS IN STANDARDS 414A AND 414B MAY NOT OVERLAP.
- FIELD-LOCK GASKETS, MEGA-LUG AND UNIFLANGE COUPLINGS ARE THE ONLY APPROVED MEANS OF RESTRAINING PIPE.

SCALE: NTS	DATE: 8/24/99	CITY AND BOROUGH OF JUNEAU, ALASKA HORIZONTAL AND CONCAVE UPWARD THRUST BLOCKS	
DRAWN BY: TAD	CHECKED BY: STAFF		
APPROVED BY: <i>[Signature]</i>	REVISED: 8/14/2011	STANDARD 414B	