PLAINTIFF'S EXHIBIT
CT-1331

AMERICAN NATIONAL STANDARD /ASTM C 644 - 80

AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for ASBESTOS-CEMENT NONPRESSURE SMALL-DIAMETER SEWER PIPE[1]

This standard is issued under the fixed designation C 644; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

This specification has been approved for use by agencies of the Department of Defense and for listing in the DoD Index of Specifications and Standards.

1. Scope

1.1 This specification covers asbestos-cement nonpressure sewer pipe for conveying sanitary sewage by gravity flow from point of occupancy to system of disposal.

NOTE 1—The values stated in inch-pound units are to be regarded as the standard. The metric equivalents of inch-pound units given in the standard may be approximate.

NOTE 2—Rubber rings suitable for use with this pipe are covered in ASTM Specification D 1869, for Rubber Rings for Asbestos-Cement Pipe.[2]

2. Classification

2.1 Asbestos-cement sewer pipe furnished under these specifications shall be designated as Class 1500, Class 2400, and Class 3300, based on the respective crushing strengths, and furnished in 4, 5, and 6-in. (10.2, 12.7, and 15.2-cm) sizes.

2.2 The types of pipe shall be known as Type I and Type II corresponding to the chemical requirements given in Section 6 of this specification.

NOTE 3—To assist the purchaser in choosing the type of pipe most suitable for his use, guidelines for the definition of aggressiveness of water and of soil environments for selection of the proper type of asbestos-cement pipe are covered in Sections 19 to 25 ASTM Methods C 500, Testing Asbestos-Cement Pipe.[3]

3. Definitions

3.1 *pipe* — asbestos - cement nonpressure sewer pipe as defined in Sections 1, 2, and 5.

3.2 *coupling*—a coupling that is manufactured so that, when properly installed, lengths of pipe may be assembled and put into service for which they are intended.

3.3 *fittings*—wyes, tees, adaptors, etc., for use in laying asbestos-cement sewer pipe manufactured as described in Section 5 and made to such dimensions as will provide equivalent strength and tight joints when assembled with the pipe.

3.4 *purchaser*—the actual purchaser of the pipe or his authorized agents acting within the scope of the duties entrusted to them.

3.5 *lot*—those lengths of pipe of that size and class manufactured during the same shift.

4. Basis of Purchase

4.1 It is suggested to the purchaser, without being made a part of this specification, that the purchaser may request inclusion of the following information in his order or agreement for purchase of the pipe:

4.1.1 Any tests, in addition to those prescribed by this specification, as the special circumstances may require,

4.1.2 The place or places where any additional tests are to be made,

4.1.3 Description of the additional testing facilities,

4.1.4 Who shall bear the expense of such additional tests,

This specification is under the jurisdiction of ASTM Committee C-17 on Asbestos-Cement Products.

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[2] *Annual Book of ASTM Standards*, Parts 16 and 38.

[3] *Annual Book of ASTM Standards*, Part 16.

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4.1.5 Whether such additional tests may be made by any reliable sampling process or other method approved by the parties, and

4.1.6 Such other matters as the parties may find desirable to include in their written agreement.

5. Materials and Manufacture

5.1 Asbestos-cement sewer pipe shall be composed of an intimate mixture of portland cement or portland blast-furnace slag cement and asbestos fiber with or without silica, or portland-pozzolan cement and asbestos fiber. The mixture shall be free of organic additives. The material shall be of laminar construction formed under pressure to a homogeneous structure and cured to meet the physical and chemical requirements of this specification.

6. Chemical Requirements

6.1 When tested in accordance with Sections 17 and 18 of ASTM Methods C 500, the amount of uncombined calcium hydroxide shall not exceed 1.0 percent for Type II pipe.

NOTE 4—There are no chemical requirements for Type I pipe.

7. Dimensions and Permissible Variations

7.1 Couplings and coupling area of the pipe shall be machined or otherwise finished to such dimensions as will provide tight joints when assembled with proper accessories and put into service for which the pipe is intended.

7.2 The average diameter may be less than the nominal by not more than $\frac{1}{4}$ in. (0.63 cm).

7.3 The standard lengths may be 5, 6.5, 10, or 13 ft (1.52, 1.98, 3.05 or 3.96 m) ± 1 in. (2.5 cm). At least 85 percent of the total footage of any one class, type, and size, excluding short lengths, shall be furnished in standard lengths. The remaining 15 percent may be in random lengths of not less than 7 ft (2.13 m) when the standard length is 10 or 13 ft (3.05 or 3.96 m) and not less than 4 ft (1.22 m) when the standard length is 5 or 6.5 ft (1.52 or 1.98 m).

8. Workmanship

8.1 The ends of the pipe that receive the coupling shall be free of dents and gouges that will affect the tightness of the joint.

8.2 Each pipe shall be free of bulges, dents, and tears in the inside surface that result in a variation of more than $\frac{1}{16}$ in. (0.48 cm) from the adjacent unaffected portions of the surface.

8.3 Each length of pipe shall not vary in straightness by more than $\frac{1}{16}$ in./ft (5.2 mm/m) of length when the variation is measured in accordance with Section 13 of Methods C 500.

9. Sampling

9.1 For crushing tests, one full length of pipe shall be selected from each 500 lengths of 10 and 13-ft (3.05 and 3.96-m) lengths and each 1000 lengths of 5 and 6.5-ft (1.52 and 1.98-m) lengths of each size, class, and type of pipe covered by the order. One test specimen 12 in. (30.5 cm) long shall be cut from the unmachined portion of the selected length of pipe.

9.2 When uncombined calcium hydroxide tests are requested (Section 6), one sample shall be taken from each lot of pipe. The sample to be tested may be taken from any one of the specimens selected for the crushing test.

9.3 All material tested under this specification shall be in a normal air-dried condition.

10. Test Methods

10.1 *Joint Tightness:*

10.1.1 The tests outlined in this section are considered to be one-time qualification tests to establish the adequacy of the manufacturers joint design. Instead of requiring performance of these tests, the purchaser may require the manufacturer to certify that pipes and couplings equivalent in material and design have passed the tests enumerated in this section. At his own expense, however, the purchaser, by designation with his order, may require that assembled pipes and couplings pass the following performance tests without leakage:

10.1.1.1 *Straight Alignment*—Make hydrostatic pressure test on an assembly of two sections of pipe, properly connected with a coupling in accordance with the joint design. An equivalent alternative may be a single pipe with a coupling on each end. Subject the assembly to an internal hydrostatic pressure of 10 psi (69 kPa) for 10 min. Any visible water leakage shall be considered a failure of the test requirements.

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10.1.1.2 *Maximum Deflected Position*—Upon completion of the test for pipes in straight alignment in accordance with 10.1.1.1, deflect the test sections 5 deg with one half of the deflection being between each pipe and the coupling and subject the test sections to an internal hydrostatic pressure of 10 psi (69 kPa) for 10 min. Any visible water leakage shall be considered a failure of the test requirements.

10.1.2 Test one sample of each size unless some other arrangement is made with the purchaser by designation with his order. At the option of the purchaser, the sample of the pipes and couplings to be tested may be selected by him.

10.2 *Flexural Strength*

10.2.1 Each length of pipe shall have sufficient flexural strength to withstand, without failure, the total load prescribed in Table 1 when tested in accordance with Section 8 of Methods C 500.

10.3 *Crushing Strength*

10.3.1 *Pipe*—Conduct crushing tests before shipment. One-foot (0.3 m) lengths of pipe cut from unmachined portions of the pipe shall have the minimum crushing strength prescribed in Table 2, when tested in accordance with Section 11.3 of Methods C 500.

10.3.2 *Couplings*—The couplings, when assembled on pipe, shall be capable of withstanding simultaneously:

10.3.2.1 The minimum crushing strength in pounds-force per linear foot prescribed in Table 2, when tested in accordance with 11.3 of Methods C 500, and

10.3.2.2 The hydrostatic pressure test described in 10.1.1.1 of this specification.

11. Inspection

11.1 All material furnished under this specification shall conform to the requirements stated herein and shall be subjected to the factory inspection and tests prescribed in this specification. When requested by the purchaser on his order, the manufacturer shall notify the purchaser of the time that the inspection and testing will take place so that the purchaser may arrange for witnessing such tests and inspections at his own expense. Instead of such inspection, when requested, the manufacturer shall be prepared to certify that his product conforms to the requirements of this specification.

11.2 Pipe and coupling shall be inspected by the manufacturer, before shipment, for compliance with the standards for dimensions, workmanship, and finish (see also Section 9).

12. Rejection

12.1 Failure of the specimens tested for crushing strength to withstand 75 percent of the load specified in 10.3 shall be cause for rejection of the entire lot represented by the test specimens. When the specimen tested for crushing strength withstands over 75 percent but under 100 percent of the load specified in 10.3, one specimen shall be cut from each of two additional pipes of the same size and class manufactured during the same shift. Failure of one of these additional specimens to meet the strength requirements of 10.3 shall be cause for rejection of the entire lot of that size and class manufactured during the same shift as the test specimen.

12.2 If the results of the uncombined calcium hydroxide test show the sample failed to meet the specification requirements, two additional specimens shall be selected and sampled for test. The failure of one of these two additional samples to meet the specification requirements of Section 6 shall be cause for rejection of the lot.

13. Marking and Shipping

13.1 Each standard and random length of pipe shall be marked by the manufacturer with the trade name, nominal size, class, and the date of manufacture. Each coupling sleeve shall be marked by the manufacturer with the nominal size and class for the pipe with which it shall be used.

13.2 Pipe and couplings shall be prepared for commercial shipment so as to ensure acceptance by common or other carriers.

14. Field Performance and Acceptance

14.1 All field-assembled joints for asbestos-cement nonpressure small diameter sewer pipe shall meet the requirements set forth in 14.5 for infiltration/exfiltration.

14.2 Measurements shall be based on a segment or segments of sewer line of asbestos-

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cement nonpressure small diameter sewer pipe installed separately or as a part of a sewer main system between two consecutive manholes or other similar increment of distance rather than taken from a single joint.

14.3 Before the sewer line is backfilled and tested, all pipe shall be inspected for proper bedding to assure uniform support of the pipe, and the absence of high points and irregularities which induce beam and shear loadings on the pipe.

14.4 Final acceptance testing shall be performed on the sewer line(s) after the final backfilling has been completed.

14.5 The infiltration/exfiltration of the installed pipe shall not exceed 0.079 gal/in. internal pipe diameter per 100 ft of pipelines h (0.386 litre/cm of internal pipe diameter per 100 m of pipelines per hour), where the maximum hydrostatic head at the center line of the pipe does not exceed 25 ft (7.63 m) (corresponds to 100 gal/in. of pipe diameter per mile per 24 h (92.6 litres/cm of pipe diameter per 1000 m per 24 h).

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply when material is supplied under this specification for U.S. Government procurement.

S1. Packaging

S1.1 Unless otherwise specified in the contract, the material shall be packaged in accordance with the producer's standard practice which will be acceptable to the carrier at lowest rates. Containers and packing shall comply with Uniform Freight Classification Rules[4] or National Motor Freight Classification Rules.[5] Marking for shipment of such material shall be in accordance with Fed. Std. No. 123 for civil agencies and MIL-STD-129 for military agencies.

S2. Responsibility for Inspection

S2.1 Unless otherwise specified in the contract or purchase order, the producer is responsible for the testing of all material to assure compliance with the requirements specified herein. Except as otherwise specified in the contract or order, the producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to assure that material conforms to prescribed requirements.

[4] Available from the Uniform Classification Commission, Room 1106, 222 S. Riverside Plaza, Chicago, Ill. 60606.

[5] Available from National Motor Freight Inc., 1616 P St., N.W., Washington, D.C. 20036.

TABLE 1 Applied Flexural Proof Loads

Nominal Size in (mm)	Total Applied Load, lbf (kN)
4 (100)	550 (2440)
5 (125)	950 (3780)
6 (150)	1500 (6680)

TABLE 2 Minimum Crushing Loads

Pipe Class	Crushing Strength, lbf/linear ft ((kN/m)
1500	1500 (21.8)
2400	2400 (35.0)
3300	3300 (48.0)

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103, which will schedule a further hearing regarding your comments. Failing satisfaction there, you may appeal to the ASTM Board of Directors.

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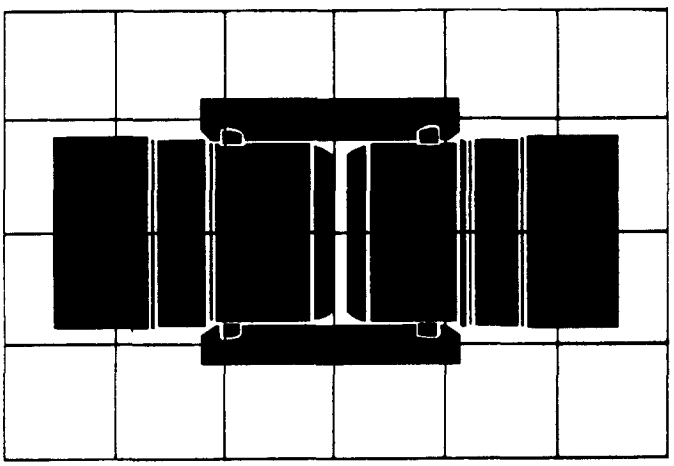
CertainTeed

AC Non-Pressure Sewer Pipe Couplings & Fittings



engineering drawings & dimensions

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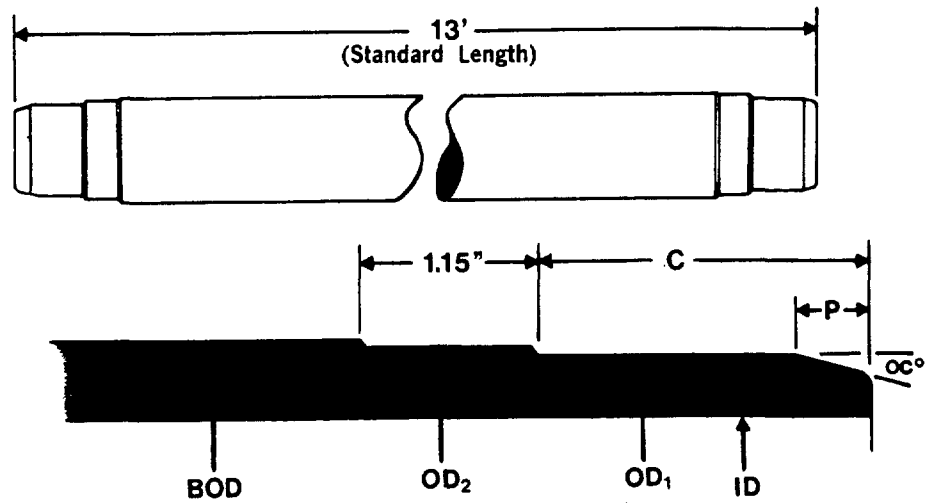
Standard, Random & Half Length (MEO)

Non-Pressure Sewer Pipe



Dimensions

Nominal Pipe Size	Nom. I.D."	O.D.1"	O.D.2"	C"	P"	OC
8"	8.00	8.80	8.96	2.44	.50	16
10"	10.00	10.89	11.05	2.81	.62	16
12"	12.00	12.99	13.15	2.81	.62	16
14"	14.00	15.07	15.26	3.19	.68	18
15"	15.00	16.11	16.30	3.19	68	18
16"	16.00	17.15	17.34	3.19	68	18
18"	18.00	19.23	19 48	3.81	75	20
20"	20.00	21.29	21.54	3.81	.75	20
21"	21.00	22.37	22.62	3.81	.75	20
24"	24.00	25.51	25.76	3.81	.75	20

B.O.D."

Pipe Size	Class 1500	Class 2400	Class 3300	Class 4000	Class 5000	Class 6000	Class 7000
8"	9 00	9.06	9.24				
10"	11.14	11 14	11.30	11 45	11 58		
12"	13 24	13 24	13.46	13 54	13 70		
14"	15 32	15.32	15.50	15.64	15 84		
15"	16.36	16.36	16.56	16.72	16.94		
16"	17 42	17.42	17 60	17 74	17.98		
18"		19.60	19 80	20.00	20.20	20.43	20.63
20"		21 66	21.88	22.10	22.32	22.55	22.77
21"		22.74	22.94	23.18	23 40	23.63	23 85
24"		25 88	26.12	26.36	26.60	26.79	27 03

Subject to Manufacturing Tolerances

Note: Some pipe sizes are not readily available from stock. To better service your requirements, please contact your local CertainTeed Sales Distributor or CertainTeed Sales Representative for availability.

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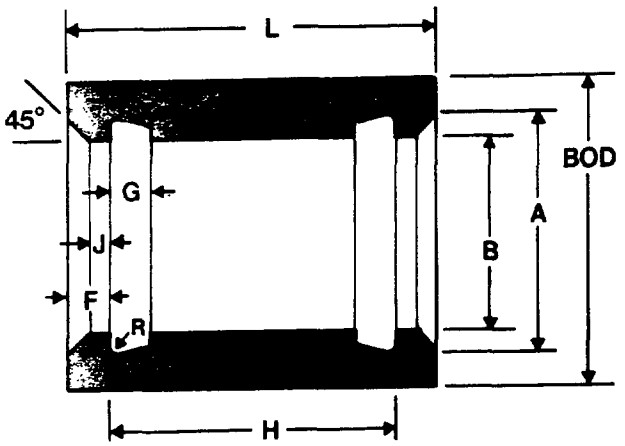
Non-Pressure Fluid-Tite® Coupling



Dimensions

Nominal Coupling Size	A"	B"	H"	L"	F"	G"	R"	J"	OC°
8"	9.55	8.89	4.00	5.75	.75	.62	.20	.50	18
10"	11.64	11.00	4.75	6.50	.75	.62	.20	.50	18
12"	13.74	13.10	4.75	6.50	.75	.62	.20	50	18
14"	16.07	15.19	5.57	7.25	.75	.78	.20	.50	18
15"	17.11	16.23	5.57	7.25	.75	.78	.20	.50	18
16"	18 15	17.27	5.57	7.25	.75	.78	.20	.50	18
18"	20.48	19.36	6.50	8.25	.75	1.00	.25	63	12
20"	22.54	21.42	6.50	8.25	.75	1.00	.25	.63	12
21"	23.62	22.50	6.50	8.25	.75	1.00	25	63	12
24"	26.70	25.64	6.50	8.25	.75	1.00	.25	.63	12

B.O.D."

Pipe Size	Class 1500	Class 2400	Class 3300	Class 4000	Class 5000	Class 6000	Class 7000
8"	10 50	10.50	10 59				
10"	12 75	12.75	12.75	13.00	13.00		
12"	15 00	15.00	15.00	15.24	15.24		
14"	17.15	17.15	17.15	17.48	17.48		
15"	18.26	18.26	18.26	18.61	18.61		
16"	19.31	19.31	19.31	19.68	19.68		
18"		21 63	21.63	22.09	22.09	22.47	22.47
20"		23.81	23.81	24.15	24.15	24.67	24 67
21"		24.96	24.96	25.26	25 26	25.81	25 81
24"		28 22	28.22	28.69	28.69	29.15	29 15

Subject to Manufacturing Tolerances

Note: Some pipe sizes are not readily available from stock. To better service your requirements, please contact your local CertainTeed Sales Distributor or CertainTeed Sales Representative for availability.

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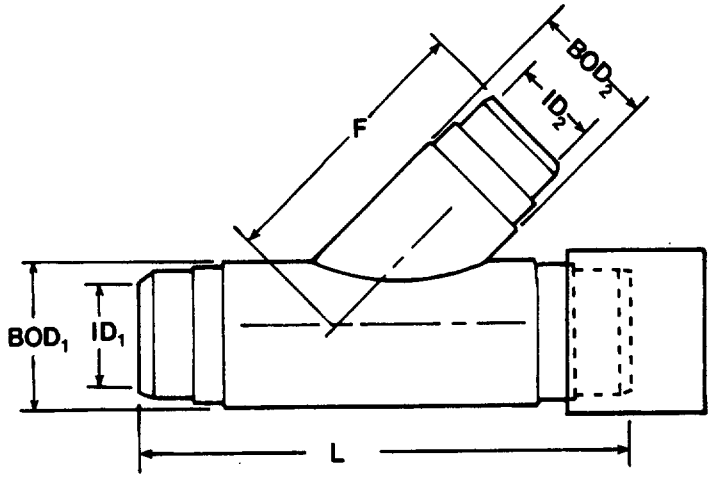
Branch Lengths (F Dim.)
(For CL 2400 Heavy and Extra Heavy)
& CL 5000-7000

60° Wye Fitting



For Pipe Class	Use Fitting Class
1500-2400	2400
1500-2400-3300	Heavy
4000-5000	Extra Heavy
6000-7000	6000/7000

BRANCH PIPE LAYING LENGTH (F DIMENSION)

Main Pipe Size, In.	4"	5"	6"	8"	10"	12"	14"	15"	16"	18"	20"	21"	24"
8 x 8	13.00	12.75	12.25	14.00									
10 x 10	14.00	13.75	13.50	14.75	16.25								
12 x 12	15.25	15.00	14.75	18.00	16.25	18.25							
14 x 14	16.50	16.00	15.75	17.25	17.25	19.00	20.25						
15 x 15	17.30	17.70	18.70	19.80	20.70	22.10	23.30	23.30					
16 x 16	17.50	17.25	17.00	18.25	18.50	20.00	21.50	22.00	23.25				
18 x 18	18.75	18.50	18.00	19.50	19.50	21.25	22.50	23.00	24.00	25.25			
20 x 20	20.00	19.50	19.25	20.50	20.75	22.25	23.75	24.25	25.25	26.00	27.50		
21 x 21	20.70	21.10	21.60	23.20	24.10	25.50	26.70	27.10	27.60	28.90	29.30	29.60	
24 x 24	22.25	22.00	21.50	23.00	23.00	24.75	26.00	26.50	27.50	28.50	28.50	27.50	31.00

Main and Branch Pipe Size, Inches	B.O.D.$_1$", B.O.D.$_2$" Nom. I.D.$_1$" I.D.$_2$" All Classes	2400	Heavy	Extra Heavy	B.O.D. 6000/7000
8	8.00	9.06	9.24	—	
10	10.00	11.14	11.30	11.58	
12	12.00	13.24	13.46	13.70	
14	14.00	15.32	15.50	15.84	
15	15.00	16.36	16.56	16.94	
16	16.00	17.42	17.60	17.98	
18	18.00	19.60	19.80	20.20	20.63
20	20.00	21.66	21.88	22.32	22.77
21	21.00	22.74	22.94	23.40	23.85
24	24.00	25.88	26.12	26.60	27.03

Branch Size Inches	I.D.$_2$" All Classes	B.O.D.$_2$" All Classes
4	4.00	4.87
5	5.00	5.98
6	6.00	7.04

A/C Pipe Main Length

Main Size Inches	Branch Size Inches	L"
8 thru 16	4 thru 16	39
18 thru 24	4 thru 12	39
18 thru 24	14 thru 21	52
24	24	78

All dimensions subject to manufacturing tolerances.

Note: Some fittings are not readily available from stock. To better service your requirements, please contact your local CertainTeed Sales Distributor or CertainTeed Sales Representative for availability

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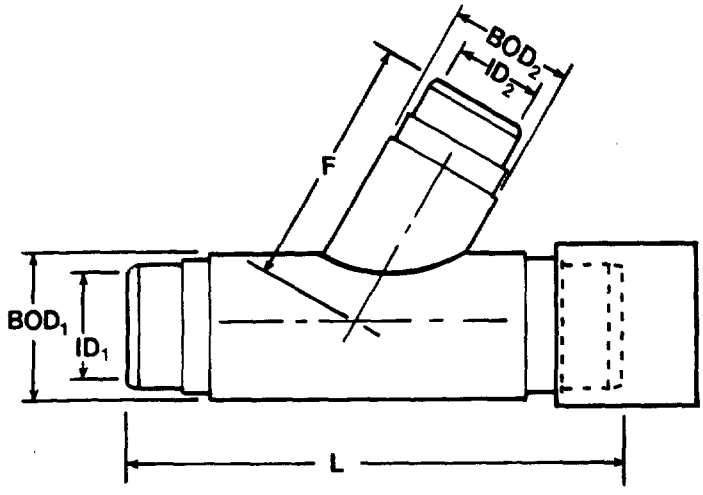
45° Wye Fitting

– Branch Lengths (F Dim.)
(For CL 2400 Heavy and Extra Heavy)
& CL 6000/7000



For Pipe Class	Use Fitting Class
1500-2400	2400
1500-2400-3300	Heavy
4000-5000	Extra Heavy
6000-7000	6000/7000

BRANCH PIPE LAYING LENGTH (F DIMENSION)

Main Pipe Size, In.	4"	5"	6"	8"	10"	12"	14"	15"	16"	18"	20"	21"	24"
8 x 8	14.00	14.00	16.25	19.00									
10 x 10	15.25	15.50	17.75	19.50	21.75								
12 x 12	16.75	17.75	19.00	20.75	22.75	23.50							
14 x 14	18.25	18.25	20.50	23.25	24.00	23.75	27.25						
15 x 15	21.40	21.90	22.30	24.80	26.30	28.20	29.70	29.70					
16 x 16	19.50	19.75	22.00	23.75	25.25	25.00	28.50	29.50	31.25				
18 x 18	21.00	21.00	23.25	25.00	26.75	26.50	29.75	29.75	31.25	34.25			
20 x 20	22.25	22.50	24.75	26.50	28.25	27.75	31.25	31.25	32.75	35.25	37.25		
21 x 21	25.70	26.10	26.60	29.00	30.50	32.50	33.90	34.20	35.10	36.80	37.80	38.10	
24 x 24	25.25	25.50	27.50	29.50	31.00	30.75	34.00	34.00	35.50	37.50	39.75	39.00	41.75

Main and Branch Pipe Size, Inches	B.O.D.$_1$", B.O.D.$_2$" Nom. I.D.$_1$" I.D.$_2$" All Classes	2400	Heavy	Extra Heavy	B.O.D. 6000/7000
8	8.00	9.06	9.24	—	
10	10.00	11.14	11.30	11.58	
12	12.00	13.24	13.46	13.70	
14	14.00	15.32	15.50	15.84	
15	15.00	16.36	16.56	16.94	
16	16.00	17.42	17.60	17.98	
18	18.00	19.60	19.80	20.20	20.63
20	20.00	21.66	21.88	22.32	22.77
21	21.00	22.74	22.94	23.40	23.85
24	24.00	25.88	26.12	26.60	27.03

Branch Size Inches	I.D.$_2$" All Classes	B.O.D.$_2$" All Classes
4	4.00	4.87
5	5.00	5.98
6	6.00	7.04

A/C Pipe Main Length

Main Size Inches	Branch Size Inches	L"
8 thru 16	4 thru 16	39
18 thru 24	4 thru 12	39
18 thru 24	14 thru 21	52
24	24	78

All dimensions subject to manufacturing tolerances.

Note: Some fittings are not readily available from stock. To better service your requirements, please contact your local CertainTeed Sales Distributor or CertainTeed Sales Representative for availability.

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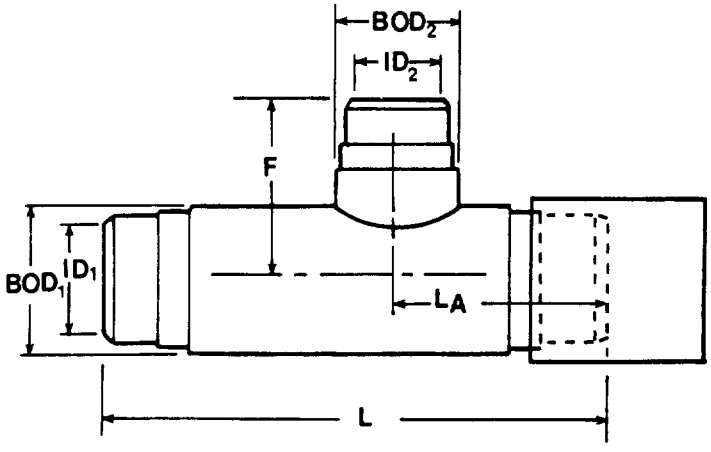
Branch Lengths (F Dim.)
(For CL 2400 Heavy and Extra Heavy)
& CL 6000/7000

Tee Fitting



For Pipe Class	Use Fitting Class
1500-2400	2400
1500-2400-3300	Heavy
4000-5000	Extra Heavy
6000-7000	6000/7000

			L_A" — All Classes
8 x 8 x 4	through	8 x 8 x 8	11.0
10 x 10 x 4	through	10 x 10 x 10	12.5
12 x 12 x 4	through	12 x 12 x 12	13.5
14 x 14 x 4	through	14 x 14 x 14	14.5
15 x 15 x 4	through	15 x 15 x 15	16.6
16 x 16 x 4	through	16 x 16 x 16	16.5
18 x 18 x 4	through	18 x 18 x 18	18.5
20 x 20 x 4	through	20 x 20 x 12	13.0
20 x 20 x 14	through	20 x 20 x 20	19.5
21 x 21 x 4	through	21 x 21 x 12	15.5
21 x 21 x 14	through	21 x 21 x 20	19.9
21 x 21 x 21			20.5
24 x 24 x 4	through	24 x 24 x 12	13.0
24 x 24 x 14	through	24 x 24 x 21	19.5
24 x 24 x 24			21.5

BRANCH PIPE LAYING LENGTH (F DIMENSION)

Main Pipe Size, In.	4"	5"	6"	8"	10"	12"	14"	15"	16"	18"	20"	21"	24"
8 x 8	8.75	8.75	10.25	10.25									
10 x 10	10.00	10.00	11.50	11.50	11.75								
12 x 12	11.00	11.00	12.50	12.50	12.75	12.75							
14 x 14	12.00	12.00	13.50	13.50	14.00	14.00	14.25						
15 x 15	14.50	14.50	14.50	15.60	15.60	16.10	16.60	16.60					
16 x 16	13.00	13.00	14.50	14.50	15.00	15.00	15.25	15.00	15.25				
18 x 18	14.25	14.25	15.75	15.75	16.25	16.25	16.50	16.25	16.50	17.25			
20 x 20	15.25	15.25	16.75	16.75	17.25	17.25	17.50	17.50	17.50	18.25	18.25		
21 x 21	17.90	17.90	17.90	19.00	19.00	19.50	20.00	20.00	20.00	20.50	20.50	20.50	
24 x 24	17.50	17.50	18.75	19.00	19.50	19.50	19.50	19.50	19.50	20.25	20.25	20.25	20.25

	B.O.D.$_1$", B.O.D.$_2$"				
Main and Branch Pipe Size, Inches	Nom. I.D.$_1$" I.D.$_2$" All Classes	2400	Heavy	Extra Heavy	B.O.D. 6000/7000
8	8.00	9.06	9.24	—	
10	10.00	11.14	11.30	11.58	
12	12.00	13.24	13.46	13.70	
14	14.00	15.32	15.50	15.84	
15	15.00	16.36	16.56	16.94	
16	16.00	17.42	17.60	17.98	
18	18.00	19.60	19.80	20.20	20.63
20	20.00	21.66	21.88	22.32	22.77
21	21.00	22.74	22.94	23.40	23.85
24	24.00	25.88	26.12	26.60	27.03

Branch Size Inches	I.D.$_2$" All Classes	B.O.D.$_2$" All Classes
4	4.00	4.87
5	5.00	5.98
6	6.00	7.04

A/C Pipe Main Length

Main Size Inches	Branch Size Inches	L"
8 thru 16	4 thru 16	39
18 thru 24	4 thru 12	39
18 thru 24	14 thru 21	52
24	24	78

All dimensions subject to manufacturing tolerances.

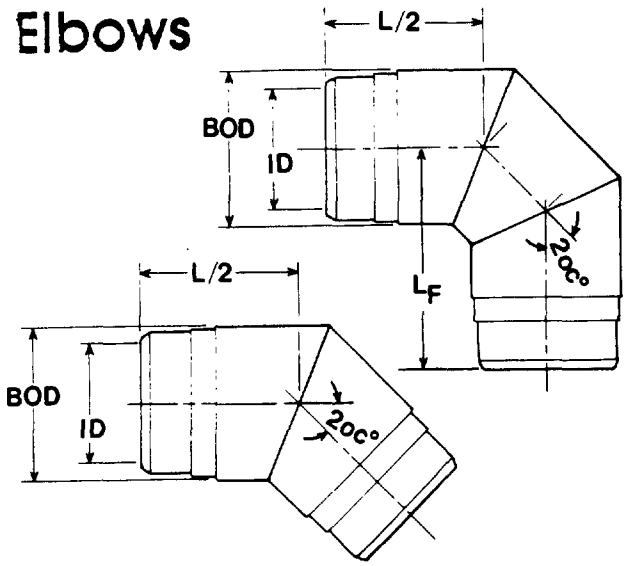
Note: Some fittings are not readily available from stock. To better service your requirements, please contact your local CertainTeed Sales Distributor or CertainTeed Sales Representative for availability.

CTD023775

Elbows 11 1/4°, 22 1/2° 30°, 45° & 90°

Increaser End Cap

Elbows



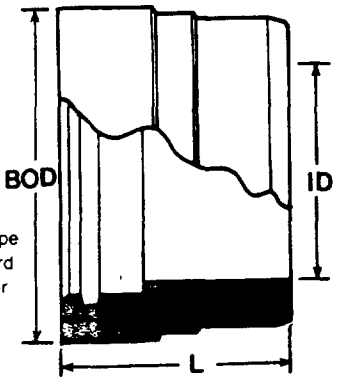
For Pipe Class	Use Fitting Class
1500-2400	2400
1500-2400-3300	Heavy
4000-5000	Extra Heavy
6000-7000	6000/7000

All Pipe Sizes, All Classes	2 OC° Nom.
11¼° Elbows	11¼
22½° Elbows	22½
30° Elbows	30
45° Elbows	45
90° Elbows	45

Pipe Size	Nom I.D.", All Classes	B.O.D. 2400	Heavy	Extra Heavy	6000/7000	L/2	LF 90° Elbow
8"	8.00	9.06	9.24	—		9.75	16.47
10"	10.00	11.14	11.30	11.58		9.75	16.47
12"	12.00	13.24	13.46	13.70		9.75	16.47
14"	14.00	15.32	15.50	15.84		9.75	16.47
15"	15.00	16.36	16.56	16.94		9.75	16.29
16"	16.00	17.42	17.60	17.98		9.75	16.29
18"	18.00	19.60	19.80	20.20	20.63	19.50	32.58
20"	20.00	21.66	21.88	22.32	22.77	19.50	32.40
21"	21.00	22.74	22.94	23.40	23.85	19.50	32.40
24"	24.00	25.88	26.12	26.60	27.03	19.50	32.23

*Subject to Manufacturing Tolerances

Increaser

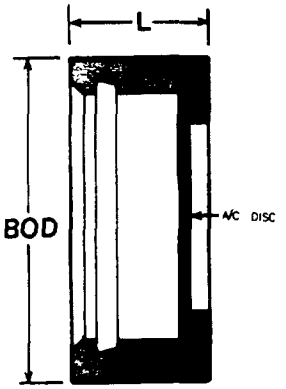


Note: Refer to Standard Pipe and Standard Coupling for dimensions not shown

*Use 20 x 21 and 21 x 24 combination

Pipe Size A/C to A/C	Nom. I.D."	Ex. Hvy. B.O.D."	B.O.D. 6000/7000	L"	X"
6" to 8"	6.00	9.24		6.25	2.38
8" to 10"	8.00	11.58		6.75	2.88
10" to 12"	10.00	13.70		7.25	3.25
12" to 14"	12.00	15.84		7.75	3.25
12" to 15"	12.00	16.94		7.75	3.25
14" to 15"	14.00	17.48		8.25	3.63
14" to 16"	14.00	17.98		8.25	3.63
15" to 16"	15.00	18.61		8.25	3.63
15" to 18"	15.00	20.20	20.63	8.75	3.63
16" to 18"	16.00	20.20	20.63	8.75	3.63
18" to 20"	18.00	22.32	22.77	9.25	4.13
18" to 21"	18.00	23.40	23.85	9.25	4.13
20" to 21"	20.00	24.15	24.67	9.25	4.13
*20" to 24" 21" to 24"	21.00	26.60		9.25	4.13

End Cap



Note: Refer to Standard Coupling for dimensions not shown

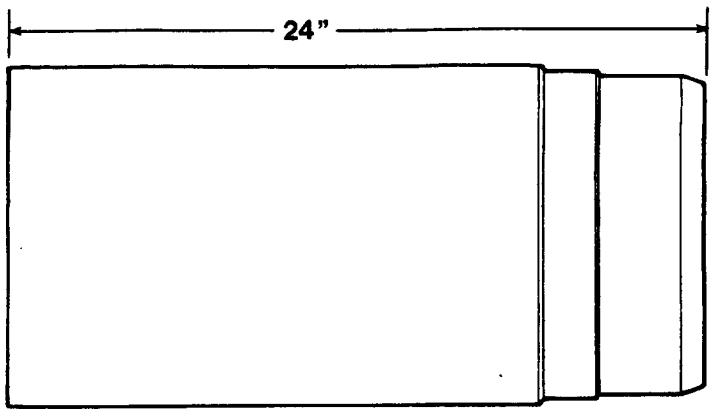
Pipe Size	B.O.D. Class 2400	Heavy	Extra Heavy	B.O.D. Class 6000/7000	L"
8"	10.50	10.59	—		4.00
10"	12.75	12.75	13 00		4.38
12"	15.00	15.00	15 24		4.63
14"	17.15	17.15	17.48		5.00
15"	18.26	18.26	18.61		5.00
16"	19.31	19.31	19.68		5.00
18"	21.63	21.63	22.09	22.47	5.75
20"	23.81	23.81	24.15	24.67	5.75
21"	24.96	24.96	25.26	25.81	5.75
24"	28.22	28.22	28.69	29.15	5 75

Note: Some fittings are not readily available from stock. To better service your requirements, please contact your local CertainTeed Sales Distributor or CertainTeed Sales Representative for availability.

Manhole Stub

Drop Manhole Section

Manhole Stub

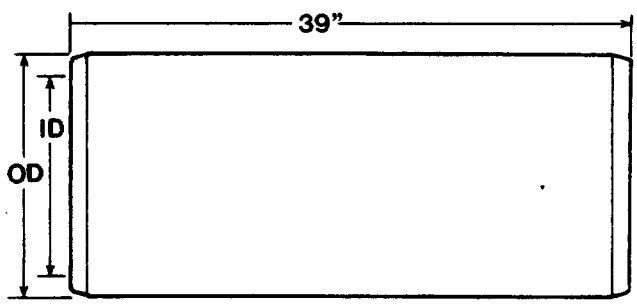


Note: 1. Refer to Standard Pipe for machined and unmachined dimensions not shown.
2. Available in all pipe sizes and classes comparable to standard pipe.

Drop Manhole Section

For Vertical Use Only

Pipe Size	Nom. I.D."	O.D."
6"	5.80	6.66
8"	7.80	8.80
10"	9.55	10.89
12"	11.45	12.99
14"	13.60	15.07
15"	14.45	16.11
16"	15.50	17.15



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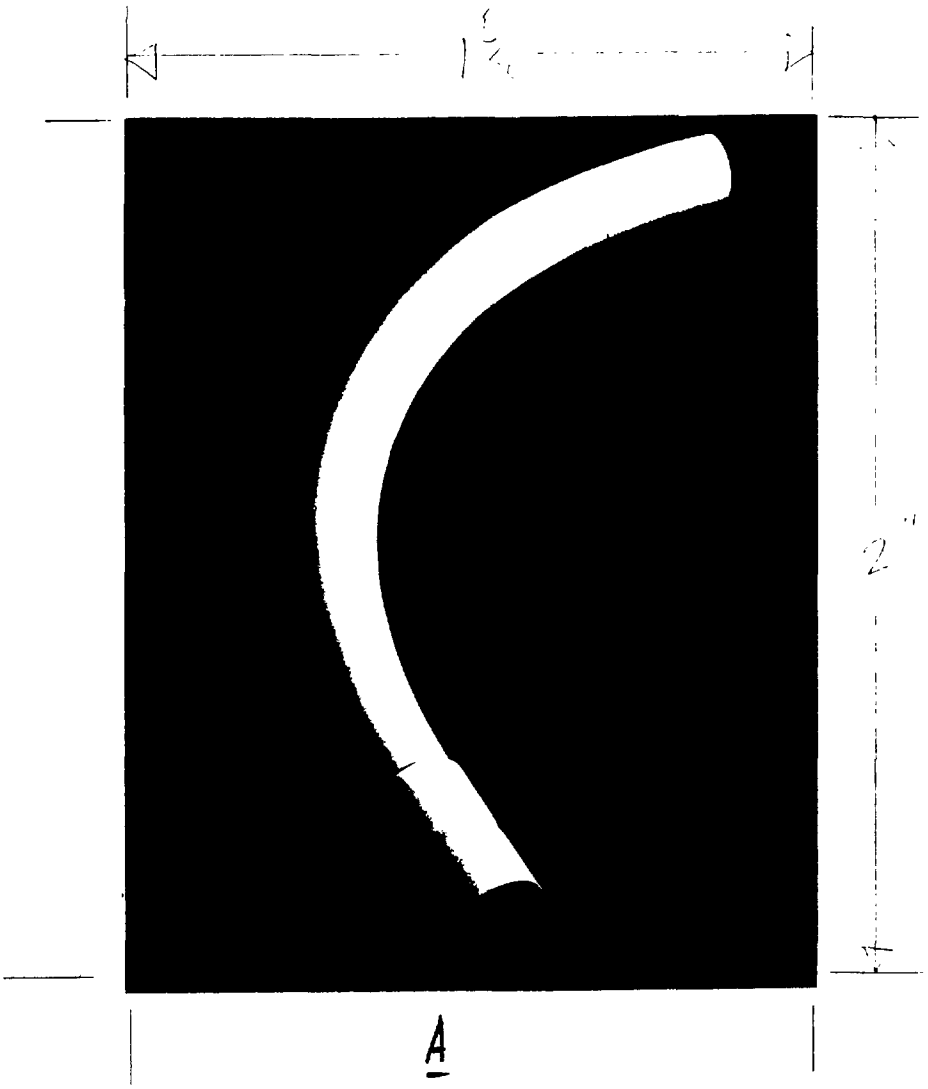

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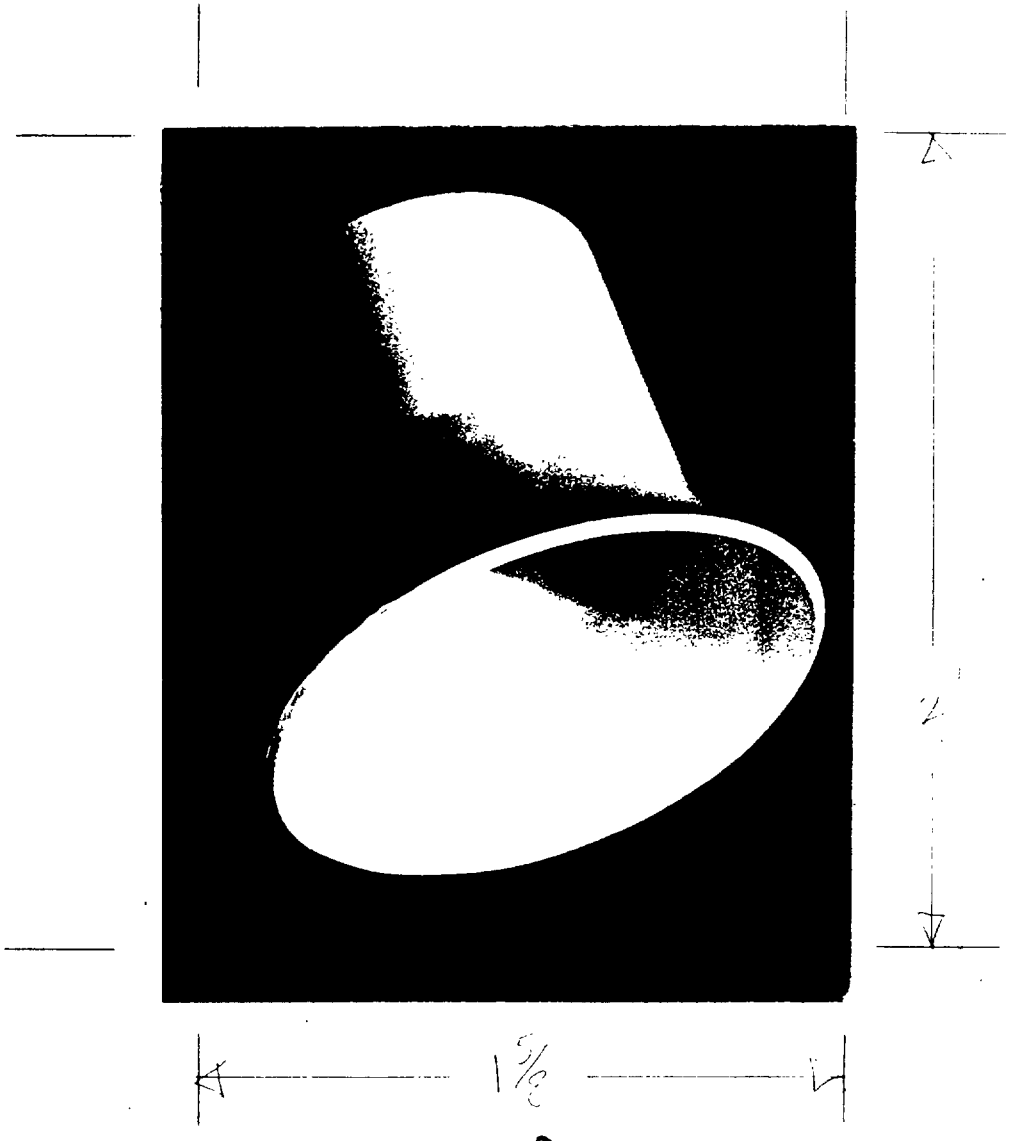

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CertainTeed

AC Non-Pressure Sewer Pipe

PIPE CLASS SELECTION

A quick method for choosing the most economical class of asbestos-cement sewer pipe to suit each laying condition

CTD023919

SAFE SUPPORTING STRENGTHS

In 1913 Professor Anson Marston and A.O Anderson presented a paper describing the theory of earth loads on underground conduits. In this paper a formula for computing the earth loading of underground conduits was presented which has become known as the "Marston Formula" and is generally accepted as the standard for computations of this type. In 1946 Professor Spangler published a paper which compiled and evaluated all of the information developed since 1913 on the theory of earth loadings on ditch conduits. Without attempting to produce an extensive report on these papers, which are very technical, there are some factors contained therein which should be considered in evaluating our class designations of non-pressure sewer pipe.

Current A/C sewer pipe specifications call for the crushing test on pipe to be performed by a method known as the "V" Block Method. This test specifies the minimum load per lineal foot that the pipes are designed to withstand. Under these test methods, our Class 2400 pipe has a minimum crushing load per lineal foot of 2400 lbs. Class 3300 would have a minimum of 3300 lbs. and so on. However, when the pipe is installed, its crushing strength is variable due to the method whereby it is installed. Table 1 takes into account these variables and selects the class of pipe suitable for the three acceptable bedding conditions. The values given in the Load Tables are calculated from the "Marston Formula" $W=CwB^2$ and assume a soil weight of 120 lbs. per cubic foot. This weight is an average accepted by most engineers. The loads listed are based on a safety factor of 1.0. They must be multiplied by the safety factor specified by the engineer.

ACCEPTABLE BEDDING CONDITIONS

ORDINARY BEDDING; CLASS C—The pipe shall be bedded in compacted granular material placed on a flat trench bottom. The granular bedding shall have a minimum thickness of 4 inches (10 cm) under the barrel and shall extend one-tenth to one-sixth of the outside diameter up the pipe barrel at the sides. The remainder of the side fills and to a minimum depth of 6 inches (15 cm) over the top of the pipe shall be filled with lightly compacted backfill. Load factor is 1.5.

FIRST CLASS BEDDING; CLASS B—The pipe shall be bedded in compacted granular material placed on a flat trench bottom. The granular bedding shall have a minimum thickness of one-fourth of the outside pipe diameter and shall extend halfway up the pipe barrel at the sides. The remainder of the side fills and a minimum depth of 12 inches (30 cm) over the top of the pipe shall be filled with carefully compacted material. Load factor is 1.9.

CONCRETE CRADLE BEDDING; CLASS A—The pipe shall be bedded in a cradle of plain or reinforced concrete having a minimum thickness of one-fourth of the outside pipe diamter or a minimum of 4 inches (10 cm) under the barrel and extending up the sides for a height equal to one-fourth the outside diameter. The cradle shall have a width at least equal to the outside diameter of the pipe barrel plus 8 inches (20 cm). Backfill above the cradle and extending to 12 inches (30 cm) above the top of the pipe shall be compacted carefully. Load factor is 2.2 to 3.4.

The above bedding conditions are recommended by the Water Pollution Control Federation Manual of Practice No. 9. In some cases, compacted backfill material would be acceptable bedding in place of granular material upon approval of the engineer.

PIPE CLASS SELECTION

Procedures for determining the class of pipe that may be safely used

Given:

1. Width of trench (measured at the top of the pipe)
2. Depth of cover
3. Superimposed wheel load
4. The Safety Factor
5. Class of bedding

Procedure:

1. Refer to Table 3 (Earth Load Tables) for size of pipe and find the expected earth load for the corresponding width of trench and depth of cover. If the weight of the soil is greater or lesser than 120 pounds per cubic foot, multiply by the appropriate percentage of difference.
2. Refer to the Superimposed Load Table No. 2 and make the necessary corrections if the load for single wheel is above 10,000 pounds
3. Add together the earth load and the superimposed load
4. Multiply the total load by the Safety Factor required by the engineer
5. Refer to Table No. 1 for safe supporting strengths and find the proper class of pipe for use with the class of bedding specified which meets the expected loads

Example:

Given: A 10" pipe must be laid using Class B bedding in clay soil (wt. = 120 lbs.. cu. ft.) with a 12' depth of cover. The width of the trench is 36". A single wheel load of 12,000 pounds is to be used. The Safety Factor is 1.5. What class of 10" can be used?

Solution:

1. In the Earth Load Table (Table 3) for 10" pipe, the expected load for a 3' wide trench and a 12' depth of cover is 2520 pounds.
2. In the Superimposed Load Table No. 2 the expected load for 10" pipe and 12' depth of cover is 30 pounds. Correction for a 12,000 pound wheel load results in a 36 pound load.
3. The total load that the pipe must support is the earth load of 2520 pounds plus the superimposed load of 36 pounds which is a total of 2556 pounds.
4. Multiply the total load by the Safety Factor of 1.5. The total load is 3834 pounds.
5. In the Safe Supporting Strengths Table No. 1, we find that Class B bedding gives a safe load of 4560 pounds per foot using class 2400 pipe. Since this is more than the expected load we would use a 10" Class 2400 pipe

TABLE 1

SAFE SUPPORTING STRENGTHS IN LBS. PER LINEAL FOOT FOR VARIOUS BEDDINGS			
Pipe Class	**Class C Bedding**	**Class B Bedding**	**Class A Bedding**
2400	3600	4560	5280 - 8160
3300	4950	6270	7620 - 11,200
4000	6000	7600	8800 - 13,600
5000	7500	9500	11,000 - 17,000
*6000	9000	11,400	13,200 - 20,400
*7000	10,500	13,300	15,400 - 23,800

*Pipe classes available in sizes 18" thru 24".

TABLE 2 Concentrated Superimposed Loads (lbs./Lin. Ft.)

The values in the following table are calculated from the equation $W = C\frac{PF}{L}$ and are based on a single wheel load of 10,000 lbs. with an Impact Factor of 1.0 (an Impact Factor of 1.0 is acceptable for depths of cover of 3 feet or more). To convert to wheel loads other than 10,000 lbs., the values in the table can be multiplied by the percentage difference in the loads i.e., a wheel load of 12,000 lbs. is 120% of the values given in the table.

DEPTH OF COVER	PIPE DIAMETER												
	4"	**5"**	**6"**	**8"**	**10"**	**12"**	**14"**	**15"**	**16"**	**18"**	**20"**	**21"**	**24"**
2'0"	350	430	490	640	790	930	1060	1120	1180	1300	1410	1450	1590
3'0"	180	230	260	340	430	510	580	620	660	740	800	840	930
4'0"	110	130	150	200	260	310	350	380	400	450	500	520	590
5'0"	70	90	100	140	170	210	240	250	270	310	340	350	400
6'0"	50	70	80	100	120	150	170	180	190	220	240	250	290
7'0"	40	50	50	70	90	100	120	140	140	160	170	180	200
8'0"	30	40	40	60	70	80	100	110	110	130	140	150	170
9'0"	20	30	30	40	50	60	80	80	80	100	110	110	130
10'0"	20	20	30	30	40	50	60	70	70	80	90	90	110
12'0"	10	20	20	30	30	40	40	50	50	60	60	70	70
14'0"	10	10	10	20	30	30	30	30	30	40	40	50	50
16'0"	10	10	10	10	20	20	30	30	30	30	40	40	40
18'0"	10	10	10	10	20	20	20	20	20	20	30	30	30
20'0"	10	10	10	10	10	10	20	20	20	20	20	20	30

TABLE 3

EARTH LOAD TABLES

4″

5″

6″

Depth of Cover	4″ PIPE			5″ PIPE			6″ PIPE			
	Trench Width			Trench Width			Trench Width			
	2'0"	2'6"	3'0"	2'0"	2'6"	3'0"	2'0"	2'6"	3'0"	3'6"
2'0"	170	170	170	200	200	200	230	230	230	230
3'0"	260	260	260	320	320	320	370	370	370	370
4'0"	360	360	360	440	440	440	510	510	510	510
5'0"	450	450	450	560	560	560	640	640	640	640
6'0"	550	550	550	670	670	670	780	780	780	780
7'0"	640	640	640	790	790	790	920	920	920	920
8'0"	740	740	740	910	910	910	1050	1050	1050	1050
9'0"	830	830	830	1030	1030	1030	1190	1190	1190	1190
10'0"	930	930	930	1140	1140	1140	1330	1330	1330	1330
12'0"	1120	1120	1120	1380	1380	1380	1470	1600	1600	1600
14'0"	1310	1310	1310	1560	1610	1610	1560	1870	1870	1870
16'0"	1500	1500	1500	1630	1650	1850	1630	2150	2150	2150
18'0"	1680	1650	1650	1680	2080	2080	1680	2420	2420	2420
20'0"	1730	1880	1880	1730	2320	2320	1730	2550	2690	2690
22'0"	1760	2070	2070	1760	2550	2550	1760	2630	2970	2970
24'0"	1790	2260	2260	1790	2700	2790	1790	2700	3240	3240
26'0"	1810	2450	2450	1810	2740	3020	1810	2740	3510	3510
28'0"	1820	2630	2630	1820	2780	3260	1820	2780	3790	3790
30'0"	1820	2780	2820	1820	2790	3490	1820	2790	3910	4060

8″

10″

Depth of Cover	8″ PIPE					10″ PIPE					
	Trench Width					Trench Width					
	2'0"	2'6"	3'0"	3'6"	4'0"	2'0"	2'6"	3'0"	3'6"	4'0"	4'6"
2'0"	290	290	290	290	290	330	330	330	330	330	330
3'0"	470	470	470	470	470	550	550	550	550	550	550
4'0"	640	640	640	640	640	770	770	770	770	770	770
5'0"	820	820	820	820	820	870	990	990	990	990	990
6'0"	1000	1000	1000	1000	1000	1010	1210	1210	1210	1210	1210
7'0"	1110	1170	1170	1170	1170	1110	1430	1430	1430	1430	1430
8'0"	1200	1350	1350	1350	1350	1200	1650	1650	1650	1650	1650
9'0"	1270	1530	1530	1530	1530	1270	1770	1860	1860	1860	1860
10'0"	1350	1710	1710	1710	1710	1350	1880	2080	2080	2080	2080
12'0"	1470	2060	2060	2060	2060	1470	2060	2520	2520	2520	2520
14'0"	1560	2210	2420	2420	2420	1560	2210	2940	2960	2960	2960
16'0"	1630	2330	2770	2770	2770	1630	2330	3120	3400	3400	3400
18'0"	1680	2480	3130	3130	3130	1680	2480	3290	3840	3840	3840
20'0"	1730	2550	3480	3480	3480	1730	2550	3460	4270	4270	4270
22'0"	1760	2630	3560	3840	3840	1760	2630	3560	4560	4710	4710
24'0"	1790	2700	3670	4200	4200	1790	2700	3670	4730	5150	5150
26'0"	1810	2740	3780	4550	4550	1810	2740	3780	4930	5590	5590
28'0"	1820	2780	3890	4910	4910	1820	2780	3890	5000	6030	6030
30'0"	1820	2790	3910	5150	5260	1820	2790	3910	5150	6430	6460

12″

Depth of Cover	12″ PIPE					
	Trench Width					
	2'0"	2'6"	3'0"	3'6"	4'0"	4'6"
2'0"	370	370	370	370	370	370
3'0"	630	630	630	630	630	630
4'0"	770	890	890	890	890	890
5'0"	870	1150	1150	1150	1150	1150
6'0"	1010	1350	1400	1400	1400	1400
7'0"	1110	1500	1660	1660	1660	1660
8'0"	1200	1640	1920	1920	1920	1920
9'0"	1270	1770	2180	2180	2180	2180
10'0"	1350	1880	2440	2440	2440	2440
12'0"	1470	2060	2700	2960	2960	2960
14'0"	1560	2210	2940	3470	3470	3470
16'0"	1630	2330	3120	3970	3990	3990
18'0"	1680	2480	3290	4190	4510	4510
20'0"	1730	2550	3460	4410	5030	5030
22'0"	1760	2630	3560	4560	5540	5540
24'0"	1790	2700	3670	4730	5860	6060
26'0"	1810	2740	3780	4930	6050	6580
28'0"	1820	2780	3890	5000	6240	7100
30'0"	1820	2790	3910	5150	6430	7610

Note These loads are based on a Safety Factor of 1.0 They must be multiplied by the Safety Factor specified by the Engineer

CTD023922

EARTH LOAD TABLES

14"

Depth of Cover	14" PIPE Trench Width						
	2'0"	2'6"	3'0"	3'6"	4'0"	4'6"	5'0"
2'0"	400	400	400	400	400	400	400
3'0"	630	700	700	700	700	700	700
4'0"	770	1000	1000	1000	1000	1000	1000
5'0"	870	1200	1300	1300	1300	1300	1300
6'0"	1010	1350	1600	1600	1600	1600	1600
7'0"	1110	1500	1900	1900	1900	1900	1900
8'0"	1200	1640	2080	2200	2200	2200	2200
9'0"	1270	1770	2270	2490	2490	2490	2490
10'0"	1350	1880	2430	2790	2790	2790	2790
12'0"	1470	2060	2700	3390	3390	3390	3390
14'0"	1560	2210	2940	3680	3990	3990	3990
16'0"	1630	2330	3120	3970	4590	4590	4590
18'0"	1680	2480	3290	4190	5090	5190	5190
20'0"	1730	2550	3460	4410	5380	5790	5790
22'0"	1760	2630	3560	4560	5610	6390	6390
24'0"	1790	2700	3670	4730	5860	6980	6980
26'0"	1810	2740	3780	4930	6050	7290	7580
28'0"	1820	2780	3890	5000	6240	7530	8180
30'0"	1820	2790	3910	5150	6430	7770	8780

15"

Depth of Cover	15" PIPE Trench Width						
	2'6"	3'0"	3'6"	4'0"	4'6"	5'0"	5'6"
2'0"	410	410	410	410	410	410	410
3'0"	760	760	760	760	760	760	760
4'0"	990	1090	1090	1090	1090	1090	1090
5'0"	1200	1430	1430	1430	1430	1430	1430
6'0"	1350	1730	1770	1770	1770	1770	1770
7'0"	1500	1910	2060	2060	2060	2060	2060
8'0"	1640	2080	2440	2440	2440	2440	2440
9'0"	1750	2270	2760	2780	2780	2780	2780
10'0"	1880	2410	2970	3110	3110	3110	3110
12'0"	2060	2700	3350	3790	3790	3790	3790
14'0"	2210	2920	3680	4420	4460	4460	4460
16'0"	2330	3120	3940	4800	5140	5140	5140
18'0"	2460	3290	4190	5090	5800	5800	5800
20'0"	2550	3450	4410	5380	6440	6480	6480
22'0"	2600	3540	4540	5610	6670	6670	6670
24'0"	2660	3640	4690	5830	7050	7300	7300
26'0"	2690	3710	4860	6020	7290	7930	7930
28'0"	2720	3790	4960	6190	7530	8550	8550
30'0"	2750	3850	5070	6350	7800	9150	9190

16"

Depth of Cover	16" PIPE Trench Width						
	2'6"	3'0"	3'6"	4'0"	4'6"	5'0"	5'6"
2'0"	420	420	420	420	420	420	420
3'0"	760	760	760	760	760	760	760
4'0"	990	1100	1100	1100	1100	1100	1100
5'0"	1200	1440	1440	1440	1440	1440	1440
6'0"	1350	1710	1780	1780	1780	1780	1780
7'0"	1500	1890	2110	2110	2110	2110	2110
8'0"	1640	2080	2450	2450	2450	2450	2450
9'0"	1770	2270	2790	2790	2790	2790	2790
10'0"	1880	2430	3020	3130	3130	3130	3130
12'0"	2060	2700	3380	3810	3810	3810	3810
14'0"	2210	2940	3680	4450	4490	4490	4490
16'0"	2330	3120	3970	4800	5160	5160	5160
18'0"	2480	3290	4190	5090	5840	5840	5840
20'0"	2550	3460	4410	5380	6440	6520	6520
22'0"	2630	3560	4560	5610	6800	7190	7190
24'0"	2700	3670	4730	5860	7050	7870	7870
26'0"	2740	3780	4930	6050	7290	8550	8550
28'0"	2780	3890	5000	6240	7530	8850	9220
30'0"	2790	3910	5150	6430	7770	9150	9900

*Note These loads are based on a Safety Factor of 1.0 They must be multiplied by the Safety Factor specified by the Engineer

18"

Depth of Cover	18" PIPE Trench Width							
	2'6"	3'0"	3'6"	4'0"	4'6"	5'0"	5'6"	6'0"
2'0"	470	470	470	470	470	470	470	470
3'0"	820	820	820	820	820	820	820	820
4'0"	990	1200	1200	1200	1200	1200	1200	1200
5'0"	1200	1460	1580	1580	1580	1580	1580	1580
6'0"	1350	1710	1970	1970	1970	1970	1970	1970
7'0"	1500	1890	2350	2350	2350	2350	2350	2350
8'0"	1640	2080	2530	2730	2730	2730	2730	2730
9'0"	1770	2270	2790	3110	3110	3110	3110	3110
10'0"	1880	2430	3020	3490	3490	3490	3490	3490
12'0"	2060	2700	3380	4030	4260	4260	4260	4260
14'0"	2210	2940	3680	4450	5020	5020	5020	5020
16'0"	2330	3120	3970	4800	5640	5790	5790	5790
18'0"	2480	3290	4190	5090	6080	6550	6550	6550
20'0"	2550	3460	4410	5380	6440	7320	7320	7320
22'0"	2630	3560	4560	5610	6800	7860	8080	8080
24'0"	2700	3670	4730	5860	7050	8250	8840	8840
26'0"	2740	3780	4930	6050	7290	8550	9610	9610
28'0"	2780	3890	5000	6240	7530	8850	10270	10370
30'0"	2790	3910	5150	6430	7770	9150	10600	11140

20"

Depth of Cover	20" PIPE Trench Width								
	2'6"	3'0"	3'6"	4'0"	4'6"	5'0"	5'6"	6'0"	6'6"
2'0"	510	510	510	510	510	510	510	510	510
3'0"	820	870	870	870	870	870	870	870	870
4'0"	990	1240	1290	1290	1290	1290	1290	1290	1290
5'0"	1200	1460	1720	1720	1720	1720	1720	1720	1720
6'0"	1350	1710	2060	2140	2140	2140	2140	2140	2140
7'0"	1500	1890	2330	2560	2560	2560	2560	2560	2560
8'0"	1640	2080	2530	2980	2980	2980	2980	2980	2980
9'0"	1770	2270	2790	3270	3400	3400	3400	3400	3400
10'0"	1880	2430	3020	3550	3830	3830	3830	3830	3830
12'0"	2060	2700	3380	4030	4620	4670	4670	4670	4670
14'0"	2210	2940	3680	4450	5230	5520	5520	5520	5520
16'0"	2330	3120	3970	4800	5640	6360	6360	6360	6360
18'0"	2480	3290	4190	5090	6080	7050	7210	7210	7210
20'0"	2550	3460	4410	5380	6440	7500	8050	8050	8050
22'0"	2630	3560	4560	5610	6800	7860	8900	8900	8900
24'0"	2700	3670	4730	5860	7050	8250	9510	9740	9740
26'0"	2740	3780	4930	6050	7290	8550	9870	10590	10590
28'0"	2780	3890	5000	6240	7530	8850	10350	11430	11430
30'0"	2790	3910	5150	6430	7770	9150	10530	12100	12280

21"

Depth of Cover	21" PIPE Trench Width							
	3'0"	3'6"	4'0"	4'6"	5'0"	5'6"	6'0"	6'6"
2'0"	530	530	530	530	530	530	530	530
3'0"	920	920	920	920	920	920	920	920
4'0"	1240	1380	1380	1380	1380	1380	1380	1380
5'0"	1480	1750	1750	1750	1750	1750	1750	1750
6'0"	1730	2060	2190	2190	2190	2190	2190	2190
7'0"	1910	2350	2630	2630	2630	2630	2630	2630
8'0"	2080	2570	3070	3070	3070	3070	3070	3070
9'0"	2270	2790	3320	3500	3500	3500	3500	3500
10'0"	2430	3020	3460	3950	3950	3950	3950	3950
12'0"	2700	3380	4030	4620	4800	4800	4800	4800
14'0"	2940	3680	4460	5230	5650	5650	5650	5650
16'0"	3120	3970	4800	5640	6550	6550	6550	6550
18'0"	3300	4190	5090	6080	7050	7400	7400	7440
20'0"	3460	4410	5380	6440	7500	8250	8250	8250
22'0"	3560	4560	5610	6800	7860	9080	9120	9120
24'0"	3670	4730	5860	7050	8250	9620	10.000	10.000
26'0"	3780	4930	6050	7290	8560	9980	10.850	10.850
28'0"	3890	5000	6240	7530	8850	10.350	11.650	11.700
30'0"	3910	5150	6430	7770	9150	10 890	12-100	12 600

Note These loads are based on a Safety Factor of 1 0 They must be multiplied by the Safety Factor specified by the Engineer

24"

Depth of Cover	24" PIPE Trench Width								
	3'0"	3'6"	4'0"	4'6"	5'0"	5'6"	6'0"	6'6"	7'0"
2'0"	630	630	630	630	630	630	630	630	630
3'0"	940	940	940	940	940	940	940	940	940
4'0"	1240	1450	1450	1450	1450	1450	1450	1450	1450
5'0"	1460	1790	1950	1950	1950	1950	1950	1950	1950
6'0"	1710	2060	2450	2450	2450	2450	2450	2450	2450
7'0"	1890	2330	2730	2960	2960	2960	2960	2960	2960
8'0"	2080	2530	3040	3460	3460	3460	3460	3460	3460
9'0"	2270	2790	3270	3840	3960	3960	3960	3960	3960
10'0"	2430	3020	3550	4080	4470	4470	4470	4470	4470
12'0"	2700	3380	4030	4740	5400	5470	5470	5470	5470
14'0"	2940	3680	4450	5230	6000	6480	6480	6480	6480
16'0"	3120	3970	4800	5640	6600	7440	7490	7490	7490
18'0"	3290	4190	5090	6080	7050	8130	8490	8490	8490
20'0"	3460	4410	5380	6440	7500	8710	9500	9500	9500
22'0"	3560	4560	5610	6800	7860	9080	10370	10510	10510
24'0"	3670	4730	5860	7050	8250	9510	10800	11510	11510
26'0"	3780	4930	6050	7290	8550	9870	11230	12520	12520
28'0"	3890	5000	6240	7530	8850	10350	11660	13190	13520
30'0"	3910	5150	6430	7770	9150	10530	12100	13690	14530

Note These loads are based on a Safety Factor of 1.0 They must be multiplied by the Safety Factor specified by the Engineer

EXCEPTIONALLY SMOOTH BORE . . . Manning factor of n = 0.010 . . . higher flow capacity.

NON-CORRODING, NON-ELECTROLYTIC . . . bore remains smooth, maintenance minimized.

STRONG AND DURABLE . . . made of age-hardening portland cement and high-tensile-strength mineral asbestos-fibers . . . high crushing strength.

TIGHT JOINTS . . . keep water and roots out.

RESILIENT JOINTS . . . absorb vibration, allow deflection at each joint.

LIGHTWEIGHT . . . pipe lengths easily handled by two men, no machinery required except in the larger sizes, transportation costs reduced.

LONG LENGTHS . . . 13′ lengths mean fewer joints, quicker laying, simplified grading and aligning.

SIMPLE TWO-STEP JOINT ASSEMBLY . . . lubricate rubber rings, slide pipe into coupling . . . That's all you need for quick assembly.

QUICK CONNECTIONS AND TIGHT JOINTS . . . with asbestos-cement tees and wyes having the FLUID-TITE feature.

NEW BRANCH CONNECTIONS EASILY MADE . . . cut hole in existing line; branch saddle easily connected.

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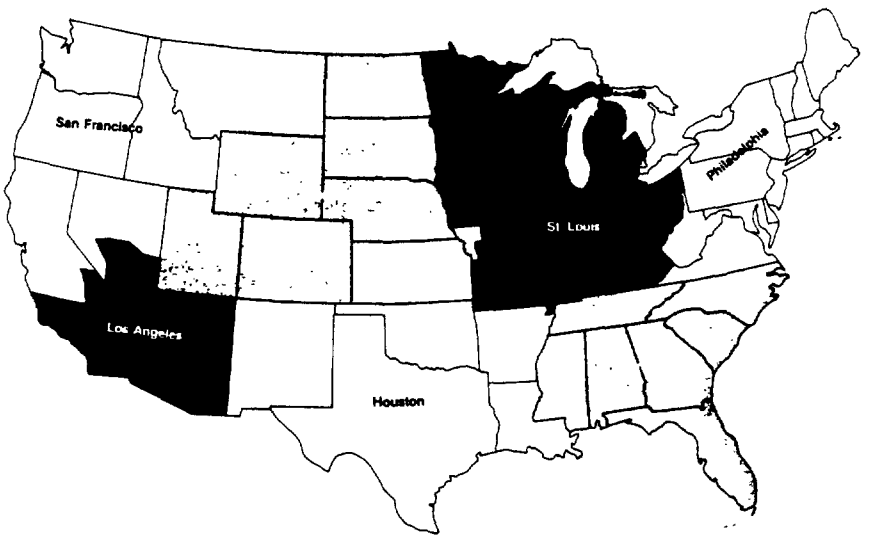

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