

# FILL HEIGHT TABLES FOR PRECAST CONCRETE PIPE

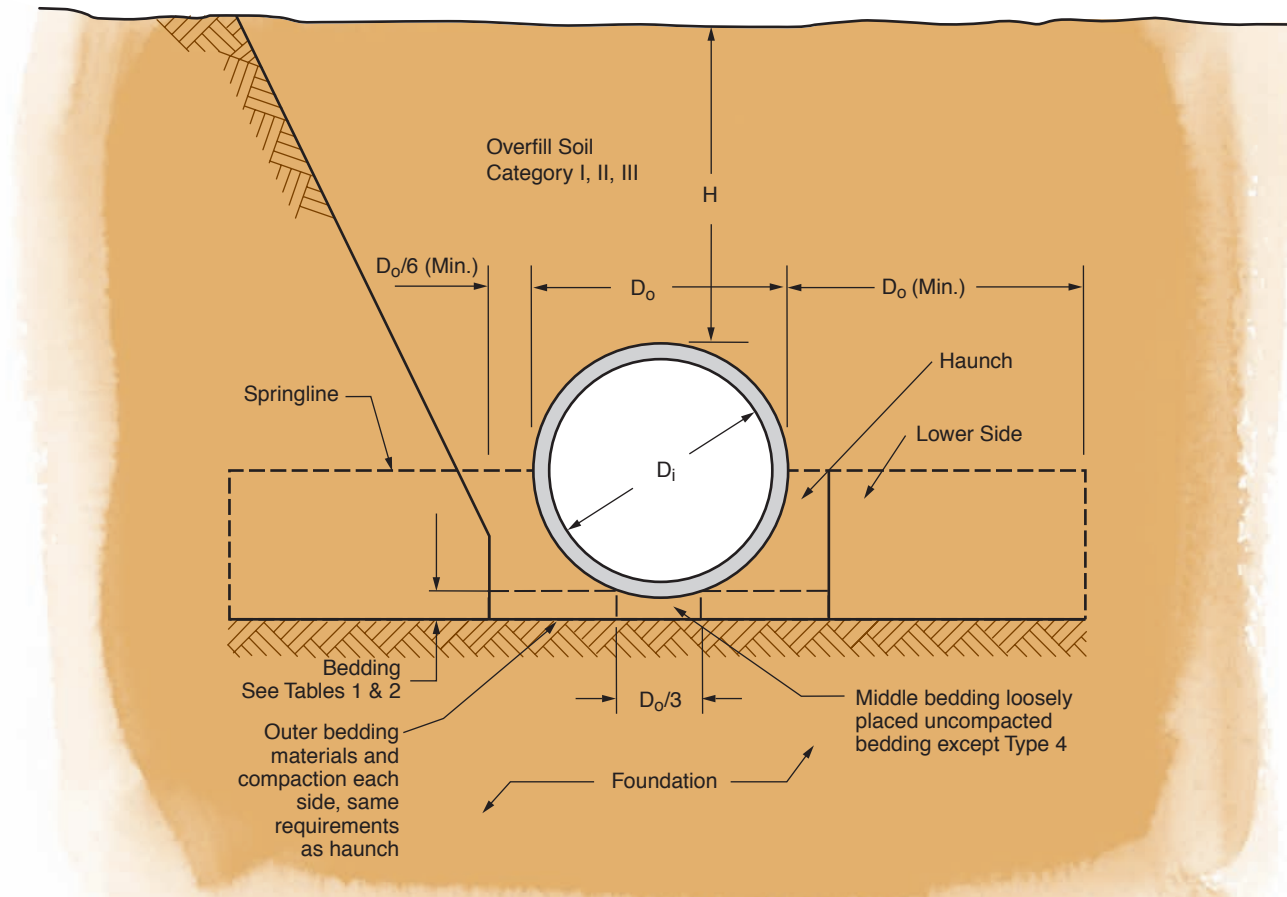


American  
**Concrete Pipe**  
Association



## Standard Trench/Embankment Installation

Concrete pipe should be installed in accordance with the AASHTO LRFD Bridge Construction Specifications, Section 27 or ASTM C1479. Figure 1 shows the basic pipe and soil terminology.



There are four types of Standard Installations, each with its own soil and compaction requirements. Type 1 bedding provides the most support using highly compacted granular material, while Type 4 provides for less support allowing the use of silts and clay soils with little or no compaction. These four choices provide flexibility and versatility for the designer and contractor, as well as performance and economy for the owner that are not available with other types of pipe.

The soil and compaction requirements are provided in Table 1. Table 2 shows

the equivalent soil designations per the Unified Soil Classification System (USCS) and AASHTO.

To facilitate your selection of the proper reinforced concrete pipe using the most beneficial Standard Installation for the conditions at the site, fill height tables are provided on the following pages. The required 0.01 inch crack D-Loads are provided numerically and the class of pipe meeting this requirement is designated by color of the cell.

Table 1: Standard Installation Soils and Minimum Compaction Requirements			
Installation Type	Bedding Thickness	Haunch and Outer Bedding	Lower Side
Type 1	D <sub>o</sub> /24 minimum, not less than 3" (75 mm) If rock foundation, use D <sub>o</sub> /12 minimum, not less than 6" (150 mm)	95% Category I	90% Category I, 95% Category II, or 100% Category III
Type 2	D <sub>o</sub> /24 minimum, not less than 3" (75 mm) If rock foundation, use D <sub>o</sub> /12 minimum, not less than 6" (150 mm)	90% Category I or 95% Category II	85% Category I, 90% Category II, or 95% Category III
Type 3	D <sub>o</sub> /24 minimum, not less than 3" (75 mm) If rock foundation, use D <sub>o</sub> /12 minimum, not less than 6" (150 mm)	85% Category I, 90% Category II, or 95% Category III	85% Category I, 90% Category II, or 95% Category III
Type 4	No bedding required except if rock foundation, use D <sub>o</sub> /12 minimum, not less than 6" (150 mm)	No compaction required, except if Category III, use 85%	No compaction required, except if Category III, use 85%

Reference: ASCE 15-98, "Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations (SIDD)", 1998.

NOTES:

1. Compaction and soil symbols – i.e. "95% Category I" refers to Category I soil material with a minimum Standard Proctor compaction of 95%. See Table 2 for equivalent Modified Proctor values.
2. Soil in the outer bedding, haunch, and lower side zones shall be compacted to at least the same compaction as the majority of soil in the overfill zone.

Table 2: Equivalent USCS and AASHTO Soil Classifications for SIDD Soil Designations				
Representative Soil Types			Percent Compaction	
SIDD	USCS	AASHTO	Standard Proctor	Modified Proctor
Gravelly Sand (Category I)	SW, SP, GW, GP	A1, A3	100	95
			95	90
			90	85
			85	80
			80	75
61	59			
Sandy Silt (Category II)	GM, SM, ML, Also GC, SC with less than 20% passing #200 sieve	A2, A4	100	95
			95	90
			90	85
			85	80
			80	75
49	46			
Silty Clay (Category III)	CL, MH, GC, SC	A5, A6	100	90
			95	85
			90	80
			85	75
			80	70
45	40			
CH	A7		100	90
			95	85
			90	80
			45	40

Reference: ASCE 15-98, "Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations (SIDD)", 1998.

**Fill Height Tables are based on:**

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

**D-Load (lb/ft/ft) for Type 1 Bedding**

Class I	Class IV
Class II	Class V
Class III	Special Design

Pipe i.d. (inches)	Fill Height (feet)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
12	1125	600	425	375	375	400	400	475	500	550	575	625	675	725	750
15	1050	575	400	375	375	400	425	450	500	525	575	625	650	700	750
18	1000	550	400	375	375	400	425	450	500	525	575	600	650	700	750
21	950	525	375	350	375	400	425	450	475	525	575	600	650	700	750
24	925	525	375	350	375	400	425	450	475	525	575	625	650	700	700
27	875	500	375	350	375	400	425	450	500	525	575	625	675	700	750
30	825	500	375	350	375	400	425	450	500	525	575	625	675	725	775
33	775	475	375	350	375	400	425	450	500	525	575	625	675	725	775
36	750	475	350	350	375	400	425	450	500	550	600	625	675	725	775
42	650	475	350	350	375	400	425	450	500	550	600	650	675	725	775
48	600	450	350	350	375	400	425	450	500	550	600	650	700	750	800
54	575	400	350	350	375	400	425	475	500	550	600	650	700	750	800
60	550	400	350	350	375	400	425	475	500	550	600	650	700	750	800
66	525	375	325	350	375	400	425	475	525	575	625	650	700	750	800
72	525	375	325	350	375	400	425	475	525	575	625	675	725	775	825
78	475	375	325	350	375	425	450	475	525	575	625	675	725	775	825
84	450	375	325	350	375	425	450	475	525	575	625	675	725	775	825
90	400	375	325	350	375	425	450	500	525	600	625	675	725	775	825
96	375	375	325	350	375	425	450	500	550	600	650	700	750	800	850

**Fill Height Tables are based on:**

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

**D-Load (lb/ft/ft) for Type 1 Bedding**

	Class I		Class IV
	Class II		Class V
	Class III		Special Design

Fill Height (feet)															
Pipe i.d. (inches)	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
15	800	850	900	950	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475
18	800	850	900	925	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475
21	800	850	900	925	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1450
24	800	850	900	950	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475
27	800	850	900	950	1000	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475
30	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1325	1375	1425	1475
33	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
36	825	875	925	975	1025	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
42	825	875	925	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475	1525
48	825	875	925	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475	1525
54	825	875	925	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475	1525
60	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550
66	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550
72	850	925	950	1000	1050	1100	1150	1200	1250	1300	1375	1425	1475	1525	1575
78	875	925	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475	1525	1575
84	875	925	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475	1525	1575
90	875	925	975	1025	1075	1125	1175	1225	1275	1325	1375	1425	1475	1525	1600
96	875	925	975	1025	1075	1125	1175	1250	1300	1350	1400	1450	1500	1550	1600

**Fill Height Tables are based on:**

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

**D-Load (lb/ft/ft) for Type 1 Bedding**

Class I	Class IV
Class II	Class V
Class III	Special Design

Pipe i.d. (inches)	Fill Height (feet)														
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
12	1550	1600	1650	1700	1725	1775	1825	1875	1925	1975	2025	2075	2125	2175	2225
15	1525	1575	1625	1675	1725	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200
18	1500	1550	1600	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200
21	1500	1550	1600	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2175
24	1525	1575	1600	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200
27	1525	1575	1625	1675	1725	1775	1825	1875	1900	1950	2000	2050	2100	2150	2200
30	1525	1575	1625	1675	1725	1775	1825	1875	1925	1975	2025	2075	2125	2175	2225
33	1550	1600	1650	1700	1750	1800	1850	1900	1950	1975	2025	2075	2125	2175	2225
36	1550	1600	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200	2250
42	1575	1625	1675	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200	2250
48	1575	1625	1675	1725	1775	1825	1875	1925	1975	2025	2075	2125	2175	2225	2275
54	1575	1625	1675	1725	1775	1825	1875	1925	1975	2025	2075	2125	2175	2225	2275
60	1600	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200	2250	2300
66	1600	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200	2250	2325
72	1625	1675	1725	1775	1825	1875	1925	1975	2025	2075	2125	2175	2225	2275	2325
78	1625	1675	1725	1775	1825	1875	1925	1975	2025	2075	2125	2175	2225	2300	2350
84	1625	1675	1725	1775	1825	1900	1950	2000	2050	2100	2150	2200	2250	2300	2350
90	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2150	2200	2250	2300	2350
96	1650	1700	1750	1800	1850	1900	1950	2000	2050	2100	2175	2225	2275	2325	2375

**Fill Height Tables are based on:**

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

**D-Load (lb/ft/ft) for Type 1 Bedding**

	Class I		Class IV
	Class II		Class V
	Class III		Special Design

Fill Height (feet)															
Pipe i.d. (inches)	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
12	2275	2325	2375	2425	2475	2525	2575	2625	2675	2725	2775	2825	2875	2925	2975
15	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2725	2775	2825	2875	2925
18	2225	2275	2325	2375	2425	2475	2525	2575	2625	2675	2725	2775	2825	2875	2925
21	2225	2275	2325	2375	2425	2475	2525	2575	2625	2675	2725	2775	2825	2875	2925
24	2250	2300	2350	2375	2425	2475	2525	2575	2625	2675	2725	2775	2825	2875	2925
27	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2775	2825	2875	2925
30	2275	2325	2375	2425	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
33	2275	2325	2375	2425	2475	2525	2575	2625	2675	2725	2775	2825	2875	2925	2975
36	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950	3000
42	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950	3000
48	2325	2375	2425	2475	2525	2575	2625	2675	2725	2775	2825	2875	2925	2975	3025
54	2325	2375	2425	2475	2525	2575	2625	2675	2725	2775	2825	2875	2925	2975	3025
60	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950	3000	3050
66	2375	2425	2475	2525	2575	2625	2675	2725	2775	2825	2875	2925	2975	3025	3075
72	2375	2425	2475	2525	2575	2625	2675	2750	2800	2850	2900	2950	3000	3050	3100
78	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950	3000	3050	3100
84	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2975	3025	3075	3125
90	2400	2450	2525	2575	2625	2675	2725	2775	2825	2875	2925	2975	3025	3075	3125
96	2425	2475	2525	3575	2625	2675	2725	2775	2825	2875	2925	2975	3050	3100	3150

**Fill Height Tables are based on:**

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

**D-Load (lb/ft/ft) for Type 2 Bedding**

Class I	Class IV
Class II	Class V
Class III	Special Design







Pipe i.d. (inches)	Fill Height (feet)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
12	1150	650	475	475	500	525	575	650	700	750	825	900	950	1025	110
15	1075	625	475	450	475	525	575	625	700	750	825	875	950	1025	1075
18	1025	600	450	450	475	525	575	625	700	750	825	875	950	1025	1075
21	1000	575	450	450	475	525	575	625	700	750	825	875	950	1025	1075
24	920	575	450	450	475	525	575	650	700	775	825	900	950	1025	1100
27	900	550	450	450	475	525	575	650	700	775	825	900	975	1025	1100
30	850	550	450	450	475	525	575	650	700	775	825	900	975	1025	1100
33	800	550	425	450	475	525	575	650	700	775	850	900	975	1050	1100
36	775	525	425	450	475	525	600	650	725	775	850	900	975	1050	1125
42	675	525	425	450	475	525	600	650	725	775	850	925	975	1050	1125
48	625	500	425	450	475	550	600	650	725	775	850	925	975	1050	1125
54	600	475	425	450	500	550	600	650	725	800	850	925	1000	1050	1125
60	575	450	425	450	500	550	600	675	725	800	850	925	1000	1075	1125
66	575	450	400	450	500	550	600	675	725	800	875	950	1000	1075	1150
72	575	450	400	450	500	550	600	675	750	800	875	950	1025	1075	1150
78	525	450	400	450	500	550	625	675	750	800	875	950	1025	1075	1150
84	475	425	400	450	500	550	625	675	750	825	875	950	1025	1075	1150
90	450	425	400	450	500	550	625	675	750	825	875	950	1025	1100	1150
96	425	425	400	450	500	550	625	675	750	825	875	950	1025	110	1175



**Fill Height Tables are based on:**

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

**D-Load (lb/ft/ft) for Type 2 Bedding**

	Class I		Class IV
	Class II		Class V
	Class III		Special Design

Fill Height (feet)															
Pipe i.d. (inches)	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12	1150	1225	1275	1350	1425	1500	1550	1625	1700	1750	1825	1900	1975	2050	2125
15	1150	1200	1275	1325	1400	1475	1550	1625	1675	1750	1825	1875	1950	2025	2100
18	1150	1200	1275	1350	1400	1475	1550	1600	1675	1750	1825	1875	1950	2025	2100
21	1150	1200	1275	1350	1400	1475	1550	1625	1675	1750	1825	1900	1975	2025	2100
24	1150	1225	1300	1350	1425	1500	1550	1625	1700	1775	1850	1900	1975	2050	2125
27	1150	1225	1300	1350	1425	1500	1575	1625	1700	1775	1850	1925	1975	2050	2125
30	1150	1225	1300	1350	1425	1500	1575	1650	1700	1775	1850	1925	2000	2050	2125
33	1150	1225	1300	1375	1425	1500	1575	1650	1725	1800	1850	1925	2000	2075	2150
36	1175	1250	1300	1375	1450	1525	1600	1650	1725	1800	1875	1950	2000	2075	2150
42	1175	1250	1325	1375	1450	1525	1600	1675	1725	1800	1875	1950	2025	2075	2150
48	1175	1250	1325	1400	1450	1525	1600	1675	1725	1800	1875	1950	2025	2100	2150
54	1175	1250	1325	1400	1450	1525	1600	1675	1750	1825	1875	1950	2025	2100	2175
60	1200	1250	1325	1400	1475	1550	1600	1675	1750	1825	1900	1975	2050	2100	2175
66	1200	1275	1350	1400	1475	1550	1625	1700	1775	1825	1900	1975	2050	2125	2200
72	1200	1275	1350	1425	1500	1550	1625	1700	1775	1850	1925	2000	2050	2125	2200
78	1200	1275	1350	1425	1500	1575	1625	1700	1775	1850	1925	2000	2050	2125	2200
84	1225	1275	1350	1425	1500	1475	1625	1700	1775	1850	1925	2000	2075	2125	2200
90	1225	1275	1350	1425	1500	1575	1650	1700	1775	1850	1925	2000	2075	2125	2200
96	1225	1300	1350	1425	1500	1575	1650	1700	1775	1850	1925	2000	2075	2150	2200

**Fill Height Tables are based on:**

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

**D-Load (lb/ft/ft) for Type 2 Bedding**

Class I	Class IV
Class II	Class V
Class III	Special Design

Pipe i.d. (inches)	Fill Height (feet)														
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
12	2175	2250	2325	2400	2450	2525	2600	2675	2750	2800	2875	2950	3025	3100	3150
15	2150	2225	2300	2375	2450	2500	2575	2650	2725	2775	2850	2925	3000	3075	3125
18	2150	2225	2300	2375	2450	2500	2575	2650	2725	2775	2850	2925	3000	3050	3125
21	2175	2250	2300	2375	2450	2525	2600	2650	2725	2800	2875	2925	3000	3075	3150
24	2200	2250	2325	2400	2475	2550	2600	2675	2750	2825	2900	2950	3025	3100	3175
27	2200	2275	2325	2400	2475	2550	2625	2675	2750	2825	2900	2975	3025	3100	3175
30	2200	2275	2350	2400	2475	2550	2625	2700	2750	2825	2900	2975	3050	3125	3175
33	2200	2275	2350	2425	2500	2575	2625	2700	2775	2850	2925	2975	3050	3125	3200
36	2225	2300	2375	2425	2500	2575	2650	2725	2800	2850	2925	3000	3075	3150	3225
42	2225	2300	2375	2450	2500	2575	2650	2725	2800	2850	2925	3000	3075	3150	3225
48	2225	2300	2375	2450	2525	2575	2650	2725	2800	2875	2950	3000	3075	3150	3225
54	2250	2300	2375	2450	2525	2600	2675	2725	2800	2875	2950	3025	3100	3175	3225
60	2250	2325	2400	2475	2525	2600	2675	2750	2825	2900	2975	3025	3100	3175	3250
66	2275	2325	2400	2475	2550	2625	2700	2775	2825	2900	2975	3050	3125	3200	3275
72	2275	2350	2425	2500	2575	2625	2700	2775	2850	2925	3000	3075	3125	3200	3275
78	2275	2350	2425	2500	2575	2625	2700	2775	2850	2925	3000	3075	3125	3200	3275
84	2275	2350	2425	2500	2575	2625	2700	2775	2850	2925	3000	3075	3125	3200	3275
90	2275	2350	2425	2500	2575	2625	2700	2775	2850	2925	3000	3075	3125	3200	3275
96	2275	2350	2425	2500	2575	2625	2700	2775	2850	2925	3000	3075	3125	3200	3275

## D-Load (lb/ft/ft) for Type 3 Bedding

Fill Height Tables are based on:

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

	Class I		Class IV
	Class II		Class V
	Class III		Special Design

Fill Height (feet)																		
Pipe i.d. (inches)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
12	1175	700	550	550	600	650	725	800	875	950	1050	1125	1200	1300	1375	1475	1550	1650
15	1100	675	525	550	575	650	700	775	875	950	1025	1100	1200	1275	1375	1450	1525	1600
18	1050	650	525	525	575	650	700	775	850	950	1025	1100	1200	1275	1350	1425	1525	1600
21	1000	625	500	525	575	650	700	775	850	950	1025	1100	1200	1275	1350	1425	1525	1600
24	975	600	500	525	575	650	700	775	850	950	1025	1100	1200	1275	1350	1450	1525	1600
27	925	600	500	525	575	650	700	800	875	950	1025	1125	1200	1275	1375	1450	1525	1600
30	875	600	500	525	575	650	725	800	875	950	1050	1125	1200	1300	1375	1450	1525	1625
33	825	575	500	525	575	650	725	800	875	950	1050	1125	1225	1300	1375	1450	1550	1625
36	800	575	500	525	575	650	725	800	875	975	1050	1150	1225	1300	1400	1475	1550	1650
42	700	575	500	525	600	650	725	800	900	975	1050	1150	1225	1325	1400	1475	1575	1650
48	650	550	500	525	600	650	725	825	900	975	1075	1150	1250	1325	1425	1475	1575	1650
54	625	525	500	525	600	675	750	825	900	1000	1075	1150	1250	1350	1425	1500	1575	1675
60	625	500	500	525	600	675	750	825	925	1000	1075	1175	1250	1350	1425	1500	1600	1700
66	600	500	475	550	600	675	750	850	925	1000	1100	1175	1275	1350	1450	1525	1600	1700
72	600	500	475	550	600	675	775	850	925	1025	1100	1200	1275	1375	1450	1525	1625	1725
78	550	500	475	550	600	675	775	850	925	1025	1100	1200	1300	1375	1475	1550	1625	1725
84	525	500	475	550	625	700	775	850	950	1025	1100	1200	1300	1375	1475	1550	1625	1725
90	475	500	475	550	625	700	775	850	950	1025	1125	1200	1300	1375	1475	1550	1625	1725
96	450	475	475	550	625	700	775	850	950	1025	1125	1200	1300	1375	1475	1550	1650	1725

**Fill Height Tables are based on:**

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

**D-Load (lb/ft/ft) for Type 3 Bedding**

Class I	Class IV
Class II	Class V
Class III	Special Design

Pipe i.d. (inches)	Fill Height (feet)																
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
12	1725	1825	1900	2000	2075	2175	2250	2350	2425	2525	2600	2700	2800	2875	2975	3050	3150
15	1700	1775	1875	1950	2050	2125	2225	2300	2400	2475	2575	2675	2750	2850	2925	3025	3100
18	1675	1775	1850	1950	2025	2125	2200	2300	2375	2475	2550	2650	2725	2825	2900	3000	3075
21	1675	1775	1850	1950	2025	2125	2200	2300	2375	2475	2550	2650	2750	2825	2900	3000	3075
24	1700	1775	1875	1950	2025	2125	2200	2300	2375	2475	2550	2650	2725	2825	2900	3000	3075
27	1700	1775	1875	1950	2050	2125	2225	2300	2400	2475	2575	2650	2750	2825	2925	3000	3100
30	1700	1800	1875	1975	2050	2150	2225	2325	2400	2500	2575	2675	2750	2850	2950	3025	3125
33	1725	1800	1900	1975	2075	2150	2250	2350	2425	2525	2600	2700	2775	2875	2950	3050	3125
36	1750	1825	1925	2000	2100	2175	2275	2350	2450	2525	2625	2725	2800	2900	2975	3075	3150
42	1750	1825	1925	200	2100	2175	2275	2375	2450	2550	2625	2725	2800	2900	3000	3075	3175
48	1750	1580	1925	2025	2100	2200	2275	2375	2475	2550	2650	2725	2825	2900	3000	3100	3175
54	1750	1850	1950	2025	2125	2200	2300	2400	2475	2575	2650	2750	2850	2925	3025	3100	3200
60	1775	1875	1950	2025	2125	2225	2325	2400	2500	2575	2675	2775	2850	2950	3025	3125	3225
66	1800	1875	1975	2050	2150	2250	2325	2425	2525	2600	2700	2775	2875	2975	3050	3150	3250
72	1800	1900	2000	2075	2175	2250	2350	2450	2525	2625	2725	2800	2900	3000	3075	3175	3250
78	1800	1900	2000	2075	2175	2250	2350	2450	2525	2625	2725	2800	2900	3000	3075	3175	3250
84	1800	1900	2000	2075	2175	2275	2350	2450	2525	2625	2725	2800	2900	3000	3075	3175	3275
90	1825	1900	2000	2075	2175	2275	2350	2450	2550	2625	2725	2800	2900	3000	3075	3175	3275
96	1825	1900	2000	2100	2175	2275	2350	2450	2550	2625	2725	2800	2900	3000	3075	3175	3275



## D-Load (lb/ft/ft) for Type 4 Bedding

Fill Height Tables are based on:

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

	Class I		Class IV
	Class II		Class V
	Class III		Special Design

Fill Height (feet)															
Pipe i.d. (inches)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
12	1550	950	750	800	875	950	1075	1200	1325	1450	1575	1700	1825	1950	2100
15	1450	900	750	775	850	950	1050	1150	1275	1400	1525	1650	1775	1900	2050
18	1375	850	725	750	825	925	1050	1150	1250	1375	1500	1625	1750	1900	2025
21	1325	850	700	750	825	925	1025	1125	1250	1375	1500	1600	1750	1875	2000
24	1275	825	700	725	800	900	1000	1125	1250	1350	1475	1600	1725	1850	1975
27	1150	800	700	725	800	900	1000	1125	1225	1350	1475	1600	1725	1850	1975
30	1025	800	675	725	800	900	1000	1100	1225	1350	1475	1600	1700	1850	1950
33	925	775	675	725	800	900	1000	1100	1225	1350	1475	1600	1700	1825	1950
36	850	750	675	725	800	900	1000	1100	1225	1350	1450	1575	1700	1825	1950
42	750	750	650	725	800	900	1000	1100	1225	1350	1450	1575	1700	1825	1950
48	700	675	650	725	800	900	1000	1100	1225	1350	1450	1575	1700	1825	1950
54	675	625	650	725	800	900	1000	1100	1225	1350	1450	1575	1700	1825	1950
60	675	600	650	700	800	900	1000	1100	1225	1350	1450	1575	1700	1825	1950
66	650	575	625	700	800	900	1000	1125	1225	1350	1475	1600	1700	1825	1950
72	650	575	600	700	800	900	1000	1125	1225	1350	1475	1600	1700	1825	1950
78	625	575	600	700	800	900	1000	1125	1250	1350	1475	1600	1700	1825	1950
84	575	575	600	700	800	900	1025	1125	1250	1350	1475	1600	1725	1850	1950
90	550	575	600	700	800	900	1025	1125	1250	1375	1475	1600	1725	1850	1950
96	525	575	600	700	800	925	1025	1150	1250	1375	1500	1600	1725	1850	1975

## D-Load (lb/ft/ft) for Type 4 Bedding

### Fill Height Tables are based on:

1. A soil weight of 120 lbs/ft<sup>3</sup>
2. AASHTO HS20 live load
3. Embankment installation

Class I	Class IV
Class II	Class V
Class III	Special Design

Fill Height (feet)								
Pipe i.d. (inches)	16	17	18	19	20	21	22	23
12	2225	2350	2500	2625	2775	2700	3025	3175
15	2175	2300	2450	2550	2700	2825	2950	3100
18	2125	2275	2400	2525	2650	2775	2900	3050
21	2125	2250	2375	2500	2625	2750	2875	3000
24	2100	2225	2350	2475	2600	2725	2850	2975
27	2075	2200	2325	2450	2575	2700	2825	2950
30	2075	2200	2325	2450	2575	2700	2825	2950
33	2075	2200	2325	2450	2575	2700	2825	2950
36	2075	2200	2325	2450	2550	2675	2800	2925
42	2050	2175	2300	2425	2550	2675	2800	2925
48	2050	2175	2300	2425	2550	2675	2800	2925
54	2050	2175	2300	2425	2550	2675	2800	2925
60	2050	2175	2300	2425	2550	2650	2775	2900
66	2050	2175	2300	2425	2550	2675	2775	2900
72	2050	2175	2300	2425	2550	2675	2800	2900
78	2075	2175	2300	2425	2550	2675	2800	2900
84	2075	2200	2300	2425	2550	2675	2800	2925
90	2075	2200	2325	2425	2550	2675	2800	2925
96	2075	2200	2325	2450	2550	2675	2800	2925

The preceding fill height tables are based on a concrete pipe installed in a positive projecting embankment installation with a soil unit weight of 120 lbs/ft<sup>3</sup> and HS 20 live load at the surface. The required classes of pipe do not account for construction loads or any other load induced on the pipe prior to its completed installation, or live load in excess of HS 20.

Dimensions of Circular Concrete Pipe - Metric Units					
Designated Internal Diameter mm	Actual Internal Diameter mm	Wall B		Wall C	
		Minimum Wall Thickness mm	Average Weight kg/m	Minimum Wall Thickness mm	Average Weight kg/m
300	305	50	162	69	197
375	381	57	216	75	262
450	457	63	253	82	335
525	533	69	327	88	417
600	610	75	430	94	505
675	686	82	500	100	602
750	762	88	598	107	708
825	838	94	695	113	821
900	914	100	832	119	940
975	991	113	923	125	1090
1050	1067	117	1057	132	1207
1200	1219	125	1324	144	1504
1350	1372	138	1589	157	1829
1500	1524	150	1927	169	2192
1650	1676	163	2295	182	2582
1800	1829	175	2695	194	2998
1950	1981	188	3125	207	3457
2100	2134	200	3585	219	3943
2250	2286	213	4078	232	4460
2400	2438	225	4598	244	5009
2550	2591	238	5179	257	5595
2700	2743	250	5752	269	6202
3000	3048	279	6344	298	7521
3600	3658	330	8104	349	10,540

Dimensions of Circular Concrete Pipe - Imperial Units						
Internal Diameter inches	Wall A		Wall B		Wall C	
	Minimum Wall Thickness inches	Average Weight pounds per foot	Minimum Wall Thickness inches	Average Weight pounds per foot	Minimum Wall Thickness inches	Average Weight pounds per foot
12	1-3/4	79	2	93	2-3/4	133
15	1-7/8	103	2-1/4	127	3	177
18	2	131	2-1/2	168	3-1/4	226
21	2-1/4	171	2-3/4	214	3-1/2	281
24	2-1/2	217	3	264	3-3/4	341
27	2-5/8	255	3-1/4	322	4	406
30	2-3/4	295	3-1/2	384	4-1/4	476
33	2-7/8	336	3-3/4	451	4-1/2	552
36	3	383	4	524	4-3/4	633
42	3-1/2	520	4-1/2	686	5-1/4	811
48	4	683	5	867	5-3/4	1011
54	4-1/2	864	5-1/2	1068	6-1/4	1232
60	5	1064	6	1295	6-3/4	1473
66	5-1/2	1287	6-1/2	1542	7-1/4	1735
72	6	1532	7	1811	7-3/4	2023
78	6-1/2	1797	7-1/2	2100	8-1/4	2329
84	7	2085	8	2409	8-3/4	2656
90	7-1/2	2395	8-1/2	2740	9-1/4	3004
96	8	2710	9	3090	9-3/4	3374
102	8-1/2	3078	9-1/2	3480	10-1/4	3765
108	9	3446	10	3865	10-3/4	4178
114	9-1/2	3840	10-1/2	4278	11-1/4	4611
120	10	4263	11	4716	11-3/4	5066
126	10-1/2	4690	11-1/2	5175	12-1/4	5542
132	11	5148	12	5655	12-3/4	6040
138	11-1/2	5627	12-1/2	6156	13-1/4	6558
144	12	6126	13	6679	13-3/4	7098
150	12-1/2	6647	13-1/2	7223	14-1/4	7659
156	13	7190	14	7789	14-3/4	8242
162	13-1/2	7754	14-1/2	8375	15-1/4	8846
168	14	8339	15	8983	15-3/4	9471
174	14-1/2	8945	15-1/2	9612	16-1/4	10,117
180	15	9572	16	10,263	16-3/4	10,785



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