

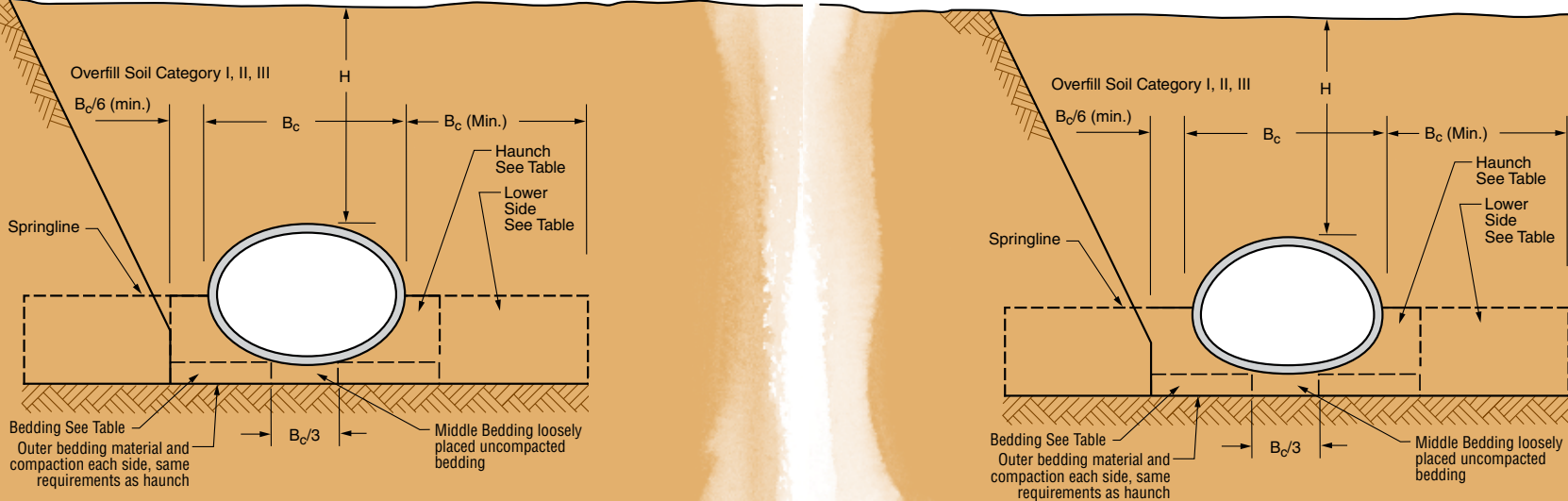
FOR HORIZONTAL ELLIPTICAL AND ARCH CONCRETE PIPE

LRFD FILL HEIGHT TABLES



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 two types of Standard Installations for horizontal elliptical and arch concrete pipe, each with its own soil and compaction requirements. Type 2 bedding provides better support using well compacted granular material, while Type 3 provides for less support allowing the use of silts. These 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 in units of lbs per linear foot per foot of span are provided numerically and the class of pipe per ASTM C506 (AASHTO M 206) or ASTM C507 (AASHTO M 207) 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 2	D _o /24 minimum, not less than 3" (75 mm) If rock foundation, use D _o /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 _o /24 minimum, not less than 3" (75 mm) If rock foundation, use D _o /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

Reference: AASHTO LRFD Bridge Construction Specifications, Section 27

Table 3: Reinforced Pipe Classes for 0.01 inch Crack Per ASTM C 506 (lbs/ft/ft)	
Class A-II	≤ 1000
Class A-III	≤ 1350
Class A-IV	≤ 2000
Special Design	> 2000

Table 4: Reinforced Pipe Classes for 0.01 inch Crack Per ASTM C 507 (lbs/ft/ft)	
Class HE-A	≤ 600
Class HE-I	≤ 800
Class HE-II	≤ 1000
Class HE-III	≤ 1350
Class HE-IV	≤ 2000
Special Design	> 2000

Table 2: Equivalent USCS and AASHTO Soil Classifications for Standard Installation 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
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
Silty Clay (Category III)	CL, MH, GC, SC	A5, A6	100	90
			95	85
			90	80
			85	75
			80	70
	CH Not allowed for haunch or bedding	A7	100	90
			95	85
			90	80
			45	40

Reference: AASHTO LRFD Bridge Construction Specifications, Section 27

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.

Horizontal Elliptical Pipe

The following Fill Height Tables have been developed by the American Concrete Pipe Association (ACPA) using the indirect design method in accordance with Section 12.10.4.3 of the AASHTO LRFD Bridge Design Specification, 4th Edition, 2007 with 2008 Interim. Live load was distributed through the pipe in accordance with Chapter 4 of the ACPA Concrete Pipe Design Manual.

Fill Height Tables are based on:

1. $\gamma_s = 120$ pcf
2. AASHTO HL-93 live load
3. Positive Projecting Embankment Condition - this gives conservative results in comparison to trench conditions
4. A projection ratio of 0.9.

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

	Class HE-A		Class HE-III
	Class HE-I		Class HE-IV
	Class HE-II		Special Design

Inside Rise x Inside Span (inches)	Fill Height (feet)														
	0.5	1	1.5	2	2.5	3	4	5	6	7	8	9	10	11	12
14 x 23	1398	1197	1087	904	796	733	682	686	724	780	843	915	991	1069	1148
19 x 30	1265	989	895	852	757	703	662	671	712	768	831	903	978	1055	1133
22 x 34	1084	857	785	773	737	686	651	662	704	761	824	896	970	1047	1125
24 x 38	1049	857	719	701	712	676	644	657	699	756	820	891	966	1042	1119
27 x 42	1133	863	680	618	589	588	606	642	690	747	810	881	954	1029	1106
29 x 45	1116	855	676	618	591	592	612	651	701	760	824	897	972	1049	1127
32 x 49	1117	877	701	625	581	584	607	647	698	757	822	895	969	1046	1124
34 x 53	1090	860	688	616	575	579	603	644	696	755	820	893	968	1044	1122
38 x 60	963	879	766	644	595	570	597	640	693	754	819	892	967	1043	1121
43 x 68	889	796	752	663	599	580	592	637	692	753	819	892	966	1043	1120
48 x 76	838	726	691	669	604	591	587	633	689	751	818	891	966	1042	1119
53 x 83	752	660	635	619	588	592	589	633	690	753	820	894	969	1045	1123
58 x 91	676	602	599	588	578	582	599	631	689	753	820	894	969	1046	1123
63 x 98	644	578	592	582	580	575	613	637	695	759	826	900	975	1052	1129
68 x 106	612	585	570	563	572	574	606	647	698	762	830	903	978	1055	1132
72 x 113	591	603	556	551	572	579	605	655	704	768	836	909	984	1061	1138
77 x 121	569	582	540	559	560	566	606	657	714	772	839	913	988	1064	1141

Horizontal Elliptical Pipe

Fill Height Tables are based on:

1. $\gamma_s = 120$ pcf
2. AASHTO HL-93 live load
3. Positive Projecting Embankment Condition - this gives conservative results in comparison to trench conditions
4. A projection ratio of 0.9.

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

	Class HE-A		Class HE-III
	Class HE-I		Class HE-IV
	Class HE-II		Special Design

Fill Height (feet)															
Inside Rise x Inside Span (inches)	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
14 x 23	1229	1311	1394	1478	1563	1647	1733	1818	1904	1990	2077	2164	2250	2337	2425
19 x 30	1213	1294	1376	1458	1541	1624	1708	1793	1877	1962	2047	2132	2217	2303	2388
22 x 34	1204	1284	1366	1447	1530	1613	1696	1779	1863	1947	2031	2116	2200	2285	2370
24 x 38	1198	1278	1359	1440	1522	1604	1687	1770	1853	1936	2020	2104	2188	2272	2356
27 x 42	1184	1262	1342	1422	1502	1583	1665	1746	1828	1910	1993	2075	2158	2241	2324
29 x 45	1206	1286	1367	1449	1531	1614	1697	1780	1863	1947	2031	2115	2199	2284	2368
32 x 49	1203	1283	1364	1445	1527	1609	1692	1775	1858	1941	2024	2108	2192	2276	2360
34 x 53	1201	1280	1361	1442	1523	1605	1687	1770	1853	1935	2019	2102	2185	2269	2353
38 x 60	1199	1279	1359	1440	1521	1603	1685	1767	1849	1932	2015	2098	2181	2264	2347
43 x 68	1199	1278	1358	1438	1519	1600	1682	1764	1846	1928	2010	2093	2176	2258	2341
48 x 76	1198	1277	1356	1437	1517	1598	1679	1761	1842	1924	2006	2089	2171	2253	2336
53 x 83	1201	1280	1360	1440	1521	1601	1683	1764	1846	1927	2009	2091	2174	2256	2338
58 x 91	1202	1281	1360	1440	1520	1601	1682	1763	1845	1926	2008	2090	2172	2254	2336
63 x 98	1207	1286	1366	1446	1526	1606	1687	1768	1850	1931	2013	2095	2176	2258	2340
68 x 106	1210	1289	1368	1448	1528	1608	1689	1770	1851	1932	2014	2095	2177	2259	2341
72 x 113	1216	1295	1374	1454	1534	1614	1695	1776	1857	1938	2019	2101	2182	2264	2346
77 x 121	1219	1298	1377	1457	1536	1617	1697	1778	1859	1940	2021	2102	2184	2265	2347

Horizontal Elliptical Pipe

Fill Height Tables are based on:

1. $\gamma_s = 120$ pcf
2. AASHTO HL-93 live load
3. Positive Projecting Embankment Condition - this gives conservative results in comparison to trench conditions
4. A projection ratio of 0.5.

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

	Class HE-A		Class HE-III
	Class HE-I		Class HE-IV
	Class HE-II		Special Design

Fill Height (feet)															
Inside Rise x Inside Span (inches)	0.5	1	1.5	2	2.5	3	4	5	6	7	8	9	10	11	12
14 x 23	1499	1462	1338	1123	997	925	871	884	938	1013	1098	1194	1294	1396	1501
19 x 30	1296	1092	1087	1062	952	890	849	868	925	1001	1085	1180	1279	1380	1484
22 x 34	1116	952	958	967	928	872	836	858	917	993	1078	1173	1271	1372	1474
24 x 38	1082	910	866	882	900	860	829	853	912	989	1074	1168	1266	1366	1468
27 x 42	1167	917	781	760	752	755	784	835	902	978	1062	1156	1252	1351	1452
29 x 45	1152	911	779	762	756	761	794	849	918	997	1083	1178	1277	1378	1481
32 x 49	1154	935	774	749	747	754	789	846	915	995	1081	1177	1276	1376	1479
34 x 53	1129	919	764	741	741	749	786	844	914	994	1080	1176	1274	1375	1477
38 x 60	1003	940	847	736	731	741	783	842	914	995	1082	1177	1276	1376	1478
43 x 68	931	860	835	761	722	735	780	842	915	997	1084	1180	1279	1379	1480
48 x 76	881	792	776	772	718	728	777	841	915	998	1086	1182	1280	1380	1482
53 x 83	797	729	724	727	708	726	778	844	920	1004	1092	1189	1287	1387	1489
58 x 91	723	673	690	698	703	718	777	845	922	1006	1096	1192	1291	1391	1492
63 x 98	694	651	686	695	711	717	786	855	933	1017	1106	1203	1301	1401	1503
68 x 106	665	661	666	679	707	721	778	863	941	1025	1114	1210	1308	1408	1509
72 x 113	647	681	655	670	710	733	780	869	952	1036	1124	1221	1319	1419	1520
77 x 121	627	662	641	681	700	725	787	866	960	1044	1132	1228	1326	1426	1527

Horizontal Elliptical Pipe

Fill Height Tables are based on:

1. $\gamma_s = 120$ pcf
2. AASHTO HL-93 live load
3. Positive Projecting Embankment Condition - this gives conservative results in comparison to trench conditions
4. A projection ratio of 0.5.

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

	Class HE-A		Class HE-III
	Class HE-I		Class HE-IV
	Class HE-II		Special Design

Inside Rise x Inside Span (inches)	Fill Height (feet)														
	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
14 x 23	1607	1715	1824	1933	2044	2155	2267	2379	2491	2604	2717	2830	2943	3057	3171
19 x 30	1588	1695	1802	1910	2018	2127	2237	2347	2458	2568	2679	2791	2902	3014	3125
22 x 34	1578	1684	1790	1897	2005	2113	2222	2331	2441	2550	2660	2771	2881	2992	3103
24 x 38	1572	1677	1782	1889	1996	2103	2211	2320	2429	2538	2647	2756	2866	2976	3086
27 x 42	1554	1657	1761	1866	1971	2077	2184	2290	2398	2505	2613	2720	2828	2937	3045
29 x 45	1585	1690	1796	1903	2010	2118	2227	2336	2445	2554	2664	2774	2884	2994	3104
32 x 49	1582	1687	1793	1899	2006	2114	2222	2330	2439	2547	2657	2766	2875	2985	3095
34 x 53	1580	1685	1790	1896	2003	2110	2217	2325	2433	2542	2650	2759	2868	2977	3087
38 x 60	1581	1685	1790	1896	2002	2109	2216	2323	2431	2539	2647	2756	2864	2973	3082
43 x 68	1583	1687	1791	1897	2002	2109	2215	2322	2429	2537	2644	2752	2860	2968	3076
48 x 76	1584	1688	1792	1897	2002	2108	2214	2321	2427	2534	2642	2749	2856	2964	3072
53 x 83	1592	1695	1799	1904	2009	2115	2221	2327	2434	2541	2648	2755	2862	2970	3077
58 x 91	1595	1698	1802	1907	2012	2117	2223	2329	2435	2542	2649	2755	2862	2970	3077
63 x 98	1605	1708	1812	1916	2021	2127	2232	2338	2444	2551	2657	2764	2871	2978	3085
68 x 106	1611	1714	1818	1922	2027	2132	2237	2343	2449	2555	2661	2767	2874	2981	3088
72 x 113	1622	1725	1828	1932	2037	2142	2247	2352	2458	2564	2670	2777	2883	2990	3097
77 x 121	1629	1731	1835	1939	2043	2148	2253	2358	2464	2569	2675	2782	2888	2994	3101

Arch Pipe

Fill Height Tables are based on:

1. $\gamma_s = 120$ pcf
2. AASHTO HL-93 live load
3. Positive Projecting Embankment Condition - this gives conservative results in comparison to trench conditions
4. A projection ratio of 0.9.

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

	Class A-II
	Class A-III
	Class A-IV
	Special Design

Fill Height (feet)															
Inside Rise x Inside Span (inches)	0.5	1	1.5	2	2.5	3	4	5	6	7	8	9	10	11	12
11 x 18	1875	1489	1138	940	823	754	696	696	732	786	849	921	997	1075	1155
13½ x 22	1476	1259	1087	902	794	730	678	681	718	772	834	906	981	1058	1137
15½ x 26	1404	1059	1030	859	758	699	651	656	693	746	806	875	947	1022	1098
18 x 28½	1234	941	925	855	759	703	660	667	707	762	825	896	971	1047	1125
22½ x 36¼	1116	907	754	732	726	677	643	654	696	752	815	886	960	1035	1113
26 ⁵ / ₈ x 43 ³ / ₈	1136	865	681	619	590	589	607	643	692	749	812	883	957	1032	1110
31 ⁵ / ₁₆ x 51 ¹ / ₈	1111	872	695	618	574	576	598	637	687	745	809	880	954	1029	1106
36 x 58½	1006	859	714	621	576	565	591	632	684	743	807	879	953	1028	1105
40 x 65	883	818	749	630	583	560	588	631	684	744	809	881	955	1031	1108
45 x 73	886	762	720	691	605	550	582	627	681	742	808	880	954	1030	1107
54 x 88	709	625	603	591	572	583	584	624	681	743	810	883	958	1033	1110
62 x 102	620	591	573	564	572	574	603	635	686	750	817	890	965	1041	1118
72 x 115	577	589	543	550	559	567	597	646	695	755	822	895	969	1045	1121
77½ x 122	563	576	534	553	554	560	600	650	706	764	831	904	978	1054	1130
87 ¹ / ₈ x 138	530	546	513	534	538	547	587	641	702	771	840	913	988	1063	1140

Arch Pipe

Fill Height Tables are based on:

1. $\gamma_s = 120$ pcf
2. AASHTO HL-93 live load
3. Positive Projecting Embankment Condition - this gives conservative results in comparison to trench conditions
4. A projection ratio of 0.5.

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

	Class A-II
	Class A-III
	Class A-IV
	Special Design

Fill Height (feet)															
Inside Rise x Inside Span (inches)	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
11 x 18	1237	1319	1403	1487	1572	1658	1744	1830	1917	2004	2091	2178	2266	2354	2442
13½ x 22	1217	1298	1380	1463	1547	1631	1715	1800	1885	1971	2056	2142	2228	2314	2401
15½ x 26	1175	1254	1333	1413	1493	1574	1656	1738	1820	1902	1985	2067	2150	2233	2316
18 x 28½	1204	1285	1366	1448	1531	1614	1697	1781	1865	1949	2034	2118	2203	2288	2373
22½ x 36¼	1191	1271	1351	1432	1513	1595	1678	1760	1843	1926	2010	2093	2177	2261	2344
26 ⁵ / ₈ x 43 ³ / ₈	1188	1267	1347	1427	1508	1590	1671	1753	1836	1918	2001	2084	2167	2250	2334
31 ⁵ / ₁₆ x 51 ¹ / ₈	1184	1262	1342	1422	1502	1583	1665	1746	1828	1910	1992	2075	2157	2240	2323
36 x 58½	1183	1261	1340	1420	1501	1581	1662	1744	1825	1907	1989	2071	2153	2235	2318
40 x 65	1186	1264	1344	1424	1504	1584	1665	1747	1828	1910	1992	2074	2156	2238	2320
45 x 73	1185	1263	1342	1422	1502	1582	1663	1744	1825	1907	1988	2070	2152	2234	2316
54 x 88	1188	1267	1346	1425	1505	1585	1666	1746	1827	1908	1990	2071	2153	2234	2316
62 x 102	1196	1274	1353	1433	1513	1593	1673	1754	1835	1916	1997	2078	2160	2241	2323
72 x 115	1198	1276	1355	1434	1513	1593	1672	1752	1833	1913	1994	2074	2155	2236	2317
77½ x 122	1207	1285	1364	1443	1522	1602	1681	1761	1842	1922	2003	2083	2164	2245	2326
87 ¹ / ₈ x 138	1217	1295	1373	1452	1531	1611	1690	1770	1850	1930	2011	2091	2172	2253	2333

Arch Pipe

Fill Height Tables are based on:

1. $\gamma_s = 120$ pcf
2. AASHTO HL-93 live load
3. Positive Projecting Embankment Condition - this gives conservative results in comparison to trench conditions
4. A projection ratio of 0.9.

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

	Class A-II
	Class A-III
	Class A-IV
	Special Design

Fill Height (feet)															
Inside Rise x Inside Span (inches)	0.5	1	1.5	2	2.5	3	4	5	6	7	8	9	10	11	12
11 x 18	2009	1816	1400	1165	1028	948	886	894	946	1020	1104	1200	1300	1403	1508
13½ x 22	1582	1537	1337	1120	993	920	865	876	930	1004	1087	1182	1280	1382	1485
15½ x 26	1433	1295	1269	1068	950	882	833	846	898	970	1051	1142	1238	1336	1436
18 x 28½	1264	1155	1143	1065	952	889	845	862	918	993	1077	1171	1269	1370	1472
22½ x 36¼	1148	958	906	918	916	861	827	849	907	983	1066	1160	1258	1357	1459
26 ⁵ / ₈ x 43 ³ / ₈	1170	919	782	761	753	756	786	838	904	981	1065	1160	1257	1356	1457
31 ⁵ / ₁₆ x 51 ¹ / ₈	1147	928	766	741	737	744	778	833	901	979	1064	1158	1255	1354	1455
36 x 58½	1043	918	791	724	725	734	773	830	900	979	1065	1159	1256	1356	1456
40 x 65	922	879	830	723	719	730	772	832	904	984	1070	1165	1263	1362	1463
45 x 73	927	825	803	789	714	723	768	830	903	985	1071	1167	1264	1363	1464
54 x 88	752	692	690	697	691	714	767	833	909	992	1080	1176	1274	1373	1474
62 x 102	668	662	664	675	702	715	769	845	922	1006	1095	1191	1289	1388	1489
72 x 115	630	664	639	665	694	717	769	852	935	1018	1106	1202	1299	1398	1498
77½ x 122	619	654	634	673	692	717	778	857	949	1033	1121	1216	1313	1412	1512
87 ¹ / ₈ x 138	592	628	617	658	682	710	777	859	953	1049	1140	1235	1332	1431	1530

Arch Pipe

Fill Height Tables are based on:

1. $\gamma_s = 120$ pcf
2. AASHTO HL-93 live load
3. Positive Projecting Embankment Condition - this gives conservative results in comparison to trench conditions
4. A projection ration of 0.5.

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

	Class A-II
	Class A-III
	Class A-IV
	Special Design

Fill Height (feet)															
Inside Rise x Inside Span (inches)	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
11 x 18	1615	1724	1833	1944	2055	2167	2279	2392	2506	2619	2733	2848	2962	3077	3191
13½ x 22	1591	1697	1805	1914	2023	2133	2244	2354	2466	2577	2689	2801	2914	3026	3139
15½ x 26	1537	1640	1744	1849	1954	2060	2167	2274	2381	2488	2596	2704	2813	2921	3030
18 x 28½	1577	1682	1789	1896	2004	2113	2222	2331	2441	2551	2662	2772	2883	2994	3106
22½ x 36¼	1562	1666	1771	1877	1984	2091	2199	2307	2415	2524	2633	2742	2851	2961	3070
26 ⁵ / ₈ x 43 ³ / ₈	1560	1663	1768	1873	1979	2086	2193	2300	2408	2516	2624	2732	2841	2950	3058
31 ⁵ / ₁₆ x 51 ¹ / ₈	1557	1660	1764	1869	1975	2080	2187	2293	2400	2508	2615	2723	2830	2938	3047
36 x 58½	1558	1661	1765	1869	1974	2080	2186	2292	2399	2505	2613	2720	2827	2935	3042
40 x 65	1565	1668	1771	1876	1981	2086	2192	2298	2405	2511	2618	2726	2833	2940	3048
45 x 73	1566	1669	1772	1876	1981	2086	2192	2297	2404	2510	2616	2723	2830	2937	3044
54 x 88	1576	1678	1782	1886	1990	2095	2200	2306	2411	2517	2623	2730	2836	2943	3049
62 x 102	1591	1694	1797	1901	2005	2110	2215	2320	2426	2531	2637	2744	2850	2956	3063
72 x 115	1599	1700	1803	1906	2009	2113	2218	2322	2427	2532	2637	2742	2848	2953	3059
77½ x 122	1613	1715	1817	1920	2024	2128	2232	2336	2441	2546	2651	2756	2862	2967	3073
87 ¹ / ₈ x 138	1631	1733	1835	1938	2041	2145	2249	2353	2458	2562	2667	2772	2877	2983	3088

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/ft³ and HL-93 live load per the AASHTO LRFD Bridge Design specifications 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 HL-93.

Dimensions of Elliptical Concrete Pipe - Metric Units					
Normal Equivalent Round size	Minor Axis, mm	Major Axis, mm	Minimum Wall Thickness, mm	Water-Way Area, m ²	Approximate Mass kg/m
450	365	575	69	.17	290
600	490	770	82	.31	446
675	550	865	88	.38	543
750	610	960	94	.47	640
825	670	1055	94	.59	707
900	730	1150	113	.68	930
975	795	1250	119	.82	1071
1050	855	1345	125	.95	1213
1200	975	1535	138	1.20	1488
1350	1095	1730	150	1.55	1838
1500	1220	1920	163	1.90	2195
1650	1340	2110	175	2.30	2597
1800	1465	2305	188	2.73	3036
1950	1585	2495	200	3.21	3497
2100	1705	2690	213	3.73	3988
2250	1830	2880	225	4.28	4538
2400	1950	3070	238	4.87	5089
2550	2075	3265	244	5.49	5543
2700	2195	3455	250	6.17	6026
2850	2315	3648	263	6.86	6652
3000	2440	3840	275	7.63	7336
3300	2680	4225	300	9.22	8780
3600	2925	4610	325	11.00	10416

Dimensions of Elliptical Concrete Pipe - Imperial Units					
Equivalent Round Size, inches	Minor Axis, inches	Major Axis, inches	Minimum Wall Thickness, inches	Water-Way Area, square feet	Approximate Weight, pounds per foot
18	14	23	2 ³ / ₄	1.8	195
24	19	30	3 ¹ / ₄	3.3	300
27	22	34	3 ¹ / ₂	4.1	365
30	24	38	3 ³ / ₄	5.1	430
33	27	42	3 ³ / ₄	6.3	475
36	29	45	4 ¹ / ₂	7.4	625
39	32	49	4 ³ / ₄	8.8	720
42	34	53	5	10.2	815
48	38	60	5 ¹ / ₂	12.9	1000
54	43	68	6	16.6	1235
60	48	76	6 ¹ / ₂	20.5	1475
66	53	83	7	24.8	1745
72	58	91	7 ¹ / ₂	29.5	2040
78	63	98	8	34.6	2350
84	68	106	8 ¹ / ₂	40.1	2680
90	72	113	9	46.1	3050
96	77	121	9 ¹ / ₂	52.4	3420
102	82	128	9 ³ / ₄	59.2	3725
108	87	136	10	66.4	4050
114	92	143	10 ¹ / ₂	74.0	4470
120	97	151	11	82.0	4930
132	106	166	12	99.2	5900
144	116	180	13	118.6	7000

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/ft³ and HL-93 live load per the AASHTO LRFD Bridge Design specifications 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 HL-93.

Dimensions of Arch Concrete Pipe - Imperial Units					
Equivalent Round Size, inches	Minor Rise, inches	Major Span, inches	Minimum Wall Thickness, inches	Water-Way Area, square feet	Approximate Weight, pounds per foot
15	11	18	2¼	1.1	125
18	13½	22	2½	1.65	170
21	15½	26	2¾	2.2	215
24	18	28½	3	2.8	260
30	22½	36¼	3½	4.4	385
36	26 ⁵ / ₈	43¾	4	6.4	525
42	31 ⁵ / ₁₆	51 ¹ / ₈	4½	8.8	690
48	36	58½	5	11.4	875
54	40	65	5½	14.3	1070
60	45	73	6	17.7	1310
72	54	88	7	25.6	1830
84	62	102	8	34.6	2415
90	72	115	8½	44.5	2910
96	77¼	122	9	51.7	3285
108	87 ¹ / ₈	138	10	66.0	4125
120	96 ⁷ / ₈	154	11	81.8	5050
132	106½	168¾	10	99.1	4970

Dimensions of Arch Concrete Pipe - Metric Units					
Normal Equivalent Round size	Minor Rise, mm	Major Span, mm	Minimum Wall Thickness, mm	Water-Way Area, m ²	Approximate Mass kg/m
375	280	460	57	0.1	187
450	345	560	63	0.15	252
525	395	660	69	0.2	321
600	460	725	75	0.26	390
750	570	920	88	0.41	570
900	675	1110	100	0.59	778
1050	795	1300	113	0.82	1021
1200	915	1485	125	1.06	1296
1350	1015	1650	138	1.33	1582
1500	1145	1855	150	1.64	1935
1800	1370	2235	175	2.38	2710
2100	1575	2590	200	3.21	3585
2250	1830	2920	213	4.13	4310
2400	1960	3100	225	4.8	4874
2700	2215	3505	250	6.13	6122
3000	2460	3910	275	7.6	7499
3300	2705	4285	250	9.21	7365



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