



TECHNICAL NOTE

Minimum and Maximum Cover Heights for SaniTite® HP Pipe for Sanitary Sewer

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Introduction

The information in this document is designed to provide answers to general cover height questions; the data provided is not intended to be used for project design. The design procedure described in the *Structures* section (Section 2) of the Drainage Handbook provides detailed information for analyzing most common installation conditions. This procedure should be utilized for project specific designs.

The two common cover height concerns are minimum cover in areas exposed to vehicular traffic and maximum cover heights. Either may be considered "worst case" scenario from a loading perspective, depending on the project conditions.

Minimum Cover in Traffic Applications

Pipe diameters from 12- through 48-inch (300-1200 mm) installed in traffic areas (AASHTO H-20, H-25, or HL-93 loads) must have at least one foot (0.3m) of cover over the pipe crown, while 60-inch (1500 mm) pipes must have at least 24 inches (0.6m) of cover. The backfill envelope must be constructed in accordance with the *Installation* section (Section 5) of the Drainage Handbook and the requirements of ASTM D2321. The backfill envelope must be of the type and compaction listed in the *Installation* section of the Drainage Handbook, Appendix A-5, Table A-5-2. In Table 1 below, this condition is represented by a Class II material compacted to 90% standard Proctor density although other material can provide similar strength at slightly lower levels of compaction. Structural backfill material should extend six inches (0.15m) over the crown of the pipe; the remaining cover should be appropriate for the installation and as specified by the design engineer. If settlement or rutting is a concern, it may be appropriate to extend the structural backfill to grade. Where pavement is involved, sub-base material can be considered in the minimum burial depth. While rigid pavements can be included in the minimum cover, the thickness of flexible pavements should not be included in the minimum cover.

Additional information that may affect the cover requirements is included in the *Installation* section (Section 5) of the Drainage Handbook. Some examples of what may need to be considered are temporary heavy equipment, construction loading, paving equipment and similar loads that are less than the design load, the potential of pipe flotation, and the type of surface treatment which will be installed over the pipe zone. Please note Table 1 and 2 are based on the installation of SaniTite HP under pavement using a uniform backfill type and compaction level, as depicted in Figure 1.

Table 1
Minimum Cover Requirements for ADS SaniTite HP with AASHTO H-20, H-25, or HL-93 Load

Inside Diameter, ID, in.(mm)	Minimum Cover ft. (m)	Inside Diameter, ID, in.(mm)	Minimum Cover ft. (m)
12 (300)	1 (0.3)	36 (900)	1 (0.3)
15 (375)	1 (0.3)	42 (1050)	1 (0.3)
18 (450)	1 (0.3)	48 (1200)	1 (0.3)
24 (600)	1 (0.3)	60 (1500)	2 (0.6)
30 (750)	1 (0.3)		

Notes:

1. Minimum covers presented here were calculated assuming Class II backfill material compacted to 90% standard Proctor density around the pipe and a minimum of 6-inches (0.15m) structural backfill over the pipe crown, as recommended in Section 5 of the Drainage Handbook, with an additional layer of compacted traffic lane sub-base for a total cover as required. In shallow traffic installations, especially where pavement is involved, a good quality compacted material to grade is required to prevent surface settlement and rutting.
2. The minimum covers specified do not include pavement thickness. A pavement section of 0.4' is typical.
3. Backfill materials and compaction levels not shown in the table may also be acceptable. Contact ADS for further detail.
4. Calculations assume no hydrostatic pressure and native soils that are as strong as the specified minimum backfill recommendations.



Maximum Cover

Wall thrust generally governs the maximum cover a pipe can withstand and conservative maximum cover heights will result when using the information presented in the *Structures* section (Section 2) of the Drainage Handbook. Table 2 below shows the material properties consistent with the expected performance characteristics for SaniTite HP materials for a 100-year design life.

The maximum burial depth is highly influenced by the type of backfill and level of compaction around the pipe. General maximum cover limits for ADS SaniTite HP used in sanitary sewer applications are shown in Table 3 for a variety of backfill conditions.

Table 3 was developed assuming pipe is installed in accordance with ASTM D2321 and the *Installation* section (Section 5) of the Drainage Handbook. Additionally, the calculations assume no hydrostatic load around the pipe, incorporate the maximum safety factors represented in *Structures* section of the Drainage Handbook, use material properties consistent with the expected performance characteristics for SaniTite HP materials, and assume the native (in-situ) soil is of adequate strength and is suitable for installation. For applications requiring fill heights greater than those shown in Table 2 or where hydrostatic pressure due to groundwater is expected, contact an ADS Engineer.

Table 2
ADS SaniTite HP Mechanical Properties

Resin	ASTM Specification	Tension Strain %	Factored Compressive Strain %	Initial		100-Year*	
				Fu (psi)	E (psi)	Fu (psi)	E (psi)
Polypropylene, Impact-modified copolymer	ASTM F2764**	2.5	3.7	3,500	175,000	1,000	27,000

*Values extrapolated from AASHTO LRFD Section 12 minimum material requirements

**ASTM F2736 has been incorporated into the latest version of ASTM F2764

Figure 1
ADS SaniTite HP Pipe Trench Detail (Sanitary Sewer)

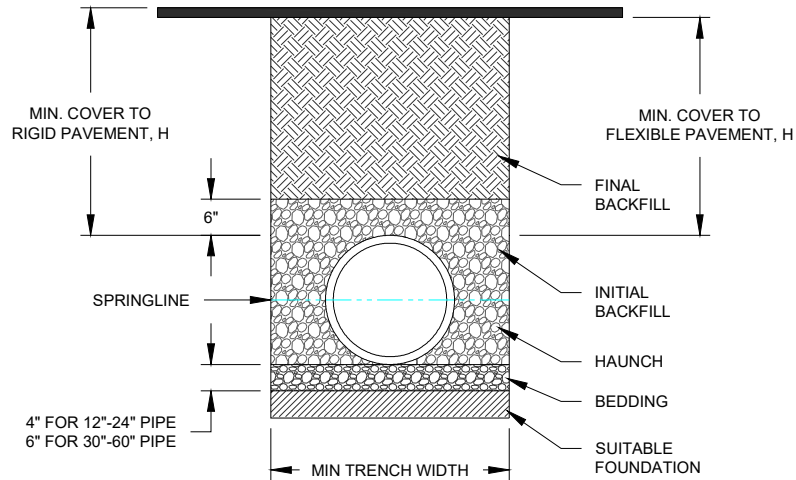


Table 3
Maximum Cover for ADS SaniTite HP Pipe for Sanitary Sewer, ft (m)

Diameter in (mm)	Class 1	Class 2	
	Compacted	95%	90%
12 (300)	40 (12.2)	28 (8.5)	20 (6.1)
15 (375)	41 (12.5)	29 (8.8)	20 (6.1)
18 (450)	43 (13.1)	29 (8.8)	21 (6.4)
24 (600)	37 (11.3)	25 (7.6)	18 (5.5)
30 (750)	30 (9.1)	21 (6.4)	15 (4.6)
36 (900)	29 (8.8)	21 (6.4)	15 (4.6)
42 (1050)	32 (9.8)	22 (6.7)	16 (4.9)
48 (1200)	33 (10.1)	23 (7.0)	16 (4.9)
60 (1500)	31 (9.4)	21 (6.4)	15 (4.6)

Notes:

1. Results based on calculations shown in the Structures section of the ADS Drainage Handbook (v20.7). Calculations assume no hydrostatic pressure and a density of 120 pcf (1926 kg/m³) for overburden material.
2. Installation assumed to be in accordance with ASTM D2321 and the Installation section of the Drainage Handbook.
3. Backfill materials and compaction levels not shown in the table may also be acceptable. Contact ADS for further detail.
4. Material must be adequately "knifed" into haunch and in between corrugations. Compaction and backfill material is assumed uniform throughout entire backfill zone.
5. Compaction levels shown are for standard Proctor density.
6. For projects where cover exceeds the maximum values listed above, contact ADS for specific design considerations.
7. See ADS Standard Detail STD-101F for additional details.