

# TECHNICAL NOTE

Minimum and Maximum Burial Depth for HDPE Pipe (per ASTM F2648)

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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.

## Minimum Cover in Traffic Applications

Pipe diameters from 4- through 48-inch (100-1200 mm) installed in traffic areas (AASHTO H-25 or HS-25 loads) must have at least one foot (0.3m) of cover over the pipe crown, while 60-inch (1500 mm) pipe 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 Table 2-3 of the Drainage Handbook. 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 (compacted Class I or flowable fill). 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.

**Table 1**  
**Minimum Cover Requirements for N-12 Pipe (per ASTM F2648)**  
**with AASHTO H-25 or HS-25 Load**

Inside Diameter, ID, in.(mm)	Minimum Cover ft. (m)	Inside Diameter, ID, in.(mm)	Minimum Cover ft. (m)
3 (75)	1 (0.3)	24 (600)	1 (0.3)
4 (100)	1 (0.3)	30 (750)	1 (0.3)
6 (150)	1 (0.3)	36 (900)	1 (0.3)
8 (200)	1 (0.3)	42 (1050)	1 (0.3)
10 (250)	1 (0.3)	48 (1200)	1 (0.3)
12 (300)	1 (0.3)	54 (1350)	2 (0.6)
15 (375)	1 (0.3)	60 (1500)	2 (0.6)
18 (450)	1 (0.3)		

*Note: 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.*

## Maximum Cover

The maximum burial depth is highly influenced by the type of backfill and level of compaction around the pipe. General maximum cover limits are shown in Table 2 for a variety of backfill conditions.

Table 2 is developed assuming pipe is installed in accordance with ASTM D2321 and the *Installation* section (Section 5) of the Drainage Handbook. Additionally, the calculations; assume zero hydrostatic load, incorporate the maximum safety factors represented in structures section of the Drainage Handbook, use material properties consistent with the expected performance characteristics for N-12 (per ASTM F2648) materials as shown in Table 3 below, and assume the native soil is of adequate strength and is suitable for installation.

**Table 2**  
**Maximum Cover for ADS N-12 Pipe (per ASTM F2648), ft (m)**

Diameter in (mm)	Class 1	Class 2		Class 3
	Compacted	95%	90%	95%
<b>4 (100)</b>	29 (8.8)	21 (6.4)	15 (4.5)	15 (4.5)
<b>6 (150)</b>	29 (8.8)	21 (6.4)	15 (4.5)	15 (4.5)
<b>8 (200)</b>	26 (7.9)	18 (5.5)	13 (3.9)	13 (3.9)
<b>10 (250)</b>	26 (7.9)	19 (5.8)	13 (3.9)	13 (3.9)
<b>12 (300)</b>	27 (8.2)	19 (5.8)	14 (4.3)	12 (3.6)
<b>15 (375)</b>	27 (8.2)	20 (6.0)	14 (4.3)	13 (3.9)
<b>18 (450)</b>	25 (7.6)	18 (5.5)	13 (3.9)	11 (3.3)
<b>24 (600)</b>	22 (6.7)	16 (4.8)	11 (3.3)	12 (3.6)
<b>30 (750)</b>	16 (4.8)	12 (3.6)	8 (2.4)	6 (1.8)
<b>36 (900)</b>	21 (6.4)	15 (4.5)	10 (3.0)	10 (3.0)
<b>42 (1050)</b>	17 (5.2)	13 (3.9)	9 (2.7)	7 (2.1)
<b>48 (1200)</b>	18 (5.5)	13 (3.9)	9 (2.7)	10 (3.0)
<b>60 (1500)</b>	20 (6.0)	15 (4.5)	10 (3.0)	10 (3.0)

**Notes:**

1. Results based on calculations shown in the Structures section of the ADS Drainage Handbook. Calculations assume a density of 120 pcf (1926 kg/m<sup>3</sup>) for overburden material.
2. Installation assumed to be in accordance with ASTM D2321 and the Installation section of the Drainage Handbook.
3. Material must be adequately "knifed" into haunch and in between corrugations. Compaction and backfill material is assumed uniform throughout entire backfill zone.
4. Compaction levels shown are for standard Proctor density.
5. Installations of pipe manufactured per ASTM F2648 are only applicable to the fill heights, type of embedment materials and compaction levels listed above.



6. *Calculations assume no hydrostatic pressure. Hydrostatic pressure will result in a reduction in allowable fill height. Reduction in allowable fill height must be assessed by the design engineer for the specific field conditions.*
7. *Fill height for dumped Class I material incorporate an additional degree of conservatism that is difficult to assess due to the large degree of variation in the consolidation of this material as it is dumped. There is limited analytical data on its performance. For this reason, values are estimated to be conservatively equivalent to Class 2, 85% SPD. For additional information on the use of Class I dumped material, contact your ADS representative.*

**Table 3**  
**N12 (per ASTM F2648) Mechanical Properties**

Cell Class	Allowable Long Term Strain %	Initial		50-Year	
		Fu (psi)	E (psi)	Fu (psi)	E (psi)
ASTM D3350 435420C	4.0	3,000	110,000	800	22,000