

Introduction

Cover height is one of the determining factors when calculating the load carrying capacity of the installation. The two most common cover height concerns are the minimum cover height in areas exposed to vehicular traffic and the maximum cover heights. These two cover heights are considered the worst-case scenarios from a loading perspective, depending on the project conditions.

The information in this document is intended to provide quick access to many cover height questions with a degree of conservatism. This data is not intended to be used for project design. Refer to Prinsco's *Structures Design Guide* for detailed information for analyzing the intended design conditions.

Minimum Cover Heights in Trafficked Conditions

Pipe with diameters of 12- to 48-inch installed subjected to AASHTO HL-93, H-25 or HS-25 traffic loads must have at least one-foot cover over the pipe crown, while 60-inch diameter pipe must have at least 18 inches of cover. Table 1 below summarizes these minimum burial depth recommendations. These minimum cover heights are measured from the top of the pipe to the bottom of flexible paving or from the top of the pipe to the top of rigid paving. Structural backfill should be placed as directed by the design engineer. However, structural fill should extend (at a minimum) to the top of the pipe. See Prinsco's *Stormwater Installation Guide* for additional information.

Table 1: Minimum Trafficked Burial Depth

Inside Diameter, in. (mm)	Minimum Cover, ft. (m)		Inside Diameter, 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)	1.5 (0.46)
30 (750)	1 (0.3)			

Note: Minimum covers for AASHTO HL-93, H-25 or HS-25 traffic loads, Class III backfill material compacted to 95% standard Proctor density around the pipe. Refer to GOLDPRO Storm Trench Installation Detail D-2-100 for more information about installation requirements.

In cases where temporary construction traffic is necessary for paving or other special construction operations, Table 2 summarizes the minimum allowable covers based on the surface ground pressure.

Table 2: Minimum Temporary Cover

Vehicular Load At Surface, psi (kPa)	Temporary Minimum Cover for up to 48" Diameter, in. (mm)	Temporary Minimum Cover for 60" Diameter, in. (mm)
75 (517)	9 (230)	12 (300)
50 (345)	6 (150)	9 (230)
25 (172)	3 (80)	6 (150)

Note: Temporary minimum cover should only be employed during construction when the vehicle load is less than 75 psi.



Maximum Cover

The maximum burial depth is significantly influenced by the type of backfill and level of compaction. Other factors influencing the burial depth includes the pipe diameter and pipe section properties. Table 3 summarizes the maximum allowable burial depths for Prinsco GOLDPRO Storm (dual wall corrugated polypropylene) based on the backfill material, compaction level, and pipe diameters.

The maximum burial depths found in Table 3 assume that the pipe was installed in accordance with Prinsco’s *Stormwater Installation Guide* and the requirements of ASTM D2321. The calculations used incorporate the maximum safety factors represented in Prinsco’s *Structures Design Guide* and assume that the material properties are consistent with the requirements of ASTM F2881 and AASHTO M330 Type S pipe as shown in Table 4. Also, the calculations assume zero hydrostatic loading and assume that the native soils are of adequate strength and are suitable for installation. For applications requiring fill heights greater than those listed in Table 3 or where hydrostatic is anticipated, contact your local Prinsco Representative.

Table 3: Maximum Burial Depth for GOLDPRO STORM Using Class I Backfill

GOLDPRO Storm Maximum Burial Depth – Class I Backfill, ft. (m)								
Diameter in. (mm)	Compacted				Uncompacted			
	Granite .75"	Granite 1.5"	Limestone	Quartzite	Granite .75"	Granite 1.5"	Limestone	Quartzite
12 (300)	53 (16.2)	39 (11.9)	41 (12.5)	49 (14.9)	47 (14.3)	32 (9.8)	32 (9.8)	41 (12.5)
15 (375)	54 (16.5)	39 (11.9)	42 (12.8)	50 (15.2)	48 (14.6)	32 (9.8)	32 (9.8)	42 (12.8)
18 (450)	59 (18.0)	43 (13.1)	45 (13.7)	55 (16.8)	52 (15.8)	35 (10.7)	35 (10.7)	45 (13.7)
24 (600)	59 (18.0)	42 (12.8)	45 (13.7)	54 (16.5)	52 (15.8)	35 (10.7)	35 (10.7)	45 (13.7)
30 (750)	53 (16.2)	38 (11.6)	41 (12.5)	49 (14.9)	47 (14.3)	31 (9.4)	31 (9.4)	41 (12.5)
36 (900)	53 (16.2)	38 (11.6)	40 (12.2)	49 (14.9)	47 (14.3)	25 (7.6)	25 (7.6)	40 (12.2)
42 (1050)	44 (13.4)	31 (9.5)	33 (10.1)	40 (12.2)	39 (11.9)	25 (7.6)	25 (7.6)	33 (10.1)
48 (1200)	44 (13.4)	31 (9.5)	33 (10.1)	41 (12.5)	39 (11.9)	25 (7.6)	25 (7.6)	33 (10.1)
60 (1500)	39 (11.9)	28 (8.5)	30 (9.2)	36 (11.0)	35 (10.7)	22 (6.7)	22 (6.7)	30 (9.2)

Notes:

- 1) Calculations assume no hydrostatic pressure and a density of 120 pcf (1926 kg/m3) for overburden material. Hydrostatic pressure will result in a reduction of allowable cover heights.
- 2) Backfill materials as defined by ASTM D2321 and compaction levels are standard proctor densities.
- 3) Installation assumed to be a trench installation in accordance with ASTM D2321 and Prinsco’s *Stormwater Installation Guide* and as outlined in the *Structures Design Guide*.
- 4) A 75-year design interval was used when calculating burial depths.
- 5) Contact your local Prinsco Representative for special designs or deeper burial depths.



Table 4: Maximum Burial Depth for GOLDPRO Storm Using Class II & III Backfill

GOLDPRO Storm Maximum Burial Depth – Class II & III Backfill, ft (m)				
Diameter in. (mm)	Class 2		Class 3	
	95%	90%	95%	90%*
12 (300)	32 (9.8)	23 (7.0)	23 (7.0)	15 (4.6)
15 (375)	32 (9.8)	23 (7.0)	23 (7.0)	15 (4.6)
18 (450)	36 (11.0)	26 (7.9)	25 (7.6)	16 (4.9)
24 (600)	35 (10.7)	25 (7.6)	24 (7.3)	15 (4.6)
30 (750)	31 (9.4)	22 (6.7)	22 (6.7)	15 (4.6)
36 (900)	31 (9.4)	21 (6.4)	21 (6.4)	14 (4.3)
42 (1050)	24 (7.3)	16 (4.9)	16 (4.9)	12 (3.7)
48 (1200)	24 (7.3)	17 (5.2)	16 (4.9)	12 (3.7)
60 (1500)	21 (6.4)	14 (4.3)	14 (4.3)	9 (2.7)

Notes:

- 1) Calculations assume no hydrostatic pressure and a density of 120 pcf (1922 kg/m³) for overburden material. Hydrostatic pressure may result in a reduction of allowable cover heights.
- 2) Backfill materials as defined by ASTM D2321 and compaction levels are standard proctor densities.
- 3) Installation assumed to be a trench installation in accordance with ASTM D2321 and Prinsco's *Installation Guide*. Backfill material must be uniformly distributed around the pipe and between the corrugations. Refer to the *GOLDPRO Storm Trench Installation Detail D-2-100* and *Structures Design Guide* for more information.
- 4) Contact your local Prinsco Representative for special designs or deeper burial depths.
- 5) A 75 year design interval was used when calculating burial depths.
- 6) *For installations using a lower quality backfill material or lower compaction levels, pipe deflection may exceed the 5% design limit, however with proper control of the installation, the deflection may not be a limiting factor for the pipe. For installations where deflection limits are critical, higher compaction levels and/or a higher quality backfill material is recommended.
- 7) For installations exceeding the cover heights listed in the table, contact your local Prinsco Representative for additional design considerations.

Table 5: Prinsco GOLDPRO Storm Dual Wall HP Pipe Mechanical Properties

Prinsco Product	Factored Tension Strain Limit ϵ_{yt} (%)	Factored Compression Strain Limit ϵ_{yc} (%)	Initial		75 Year	
			Fu psi (MPa)	E psi (MPa)	Fu psi (MPa)	E psi (MPa)
Corrugated dual-wall HP	2.5	3.7	3500 (24.1)	175000 (1207)	1000 (6.9)	28000 (193)