Technical Note

TN 2.06CSA Maximum Cover Heights for HDPE Storm Pipe, Alt. Embedment – CSA PIPE ONLY

Introduction

The information in this document is designed to provide maximum cover height values for split backfill condition installations. 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.

Fill heights presented in this technical note are applicable to 100mm through 900mm diameter ADS N-12®, N-12® ST, and N-12® WT pipe certified to CSA B182.8 "Profile Polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings."

Maximum Cover

The maximum burial depth is highly influenced by the type of backfill and level of compaction around the pipe. Maximum cover limits for ADS N-12 (CSA B182.8) HDPE pipe used in storm drainage applications are shown in Table 2 for split backfill conditions. It should be noted that while an installation condition as depicted in Figure 1 can be modeled in structural evaluations, there are constructability and practical installation considerations that should be taken into account when a designer is determining the best backfill plan for a project. Note the following conditions are not dependent on the pipe material and should be considered whenever a split backfill installation is used regardless of the pipe type.

1. Changing backfill material types at the springline of the pipe requires accounting for the different soil confining strengths of the two materials. This variation in soil strengths can result in a reduced cover height when compared to an installation where a single material type is used for the entire pipe embedment. Where materials of differing strengths are used in the pipe embedment, susceptibility to pipe deflection can increase if the materials are not properly placed and compacted.
2. When materials of different gradation are placed adjacent to each other, filter fabric separation or properly graded material, under the guidance of a geotechnical engineer, is recommended in order to prevent the migration of fines into the open-graded material.
3. The fill heights shown in Table 2 are based upon a minimum compaction density of 95% being achieved for the native material above the pipe springline. When considering moisture content and compaction effort, adequate compaction of Class 4 material can be more difficult to achieve compared to the effort of a Class 2 material used in the haunch zone of the pipe.

These considerations are not intended to explicitly allow or discourage the use of native materials above the pipe springline, but simply to state that such embedment can be successful when implemented correctly. While ADS supports that the product can perform well within these installation parameters, overall successful execution is dependent not only on the product, but on coordination, input and agreement between the owner, engineer and contractor, based on each party's needs. 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 ADS N-12 (CSA B182.8) HDPE materials as shown in Table 1 below, and assume the native soil is of adequate strength and is suitable for installation.

Table 1
ADS N-12 (CSA B182.8) HDPE Mechanical Properties

Cell Class	Allowable Long Term Compressive Strain	Allowable Long Term Tensile Strain	Initial		75-Year	
			Fu (MPa)	E (MPa)	Fu (MPa)	E (MPa)
ASTM D3350 435400C	4.1	5.0	20.7	758.4	6.2	144.8

Figure 1
ADS N-12 (CSA B182.8) HDPE Storm Pipe Split Backfill Trench Detail

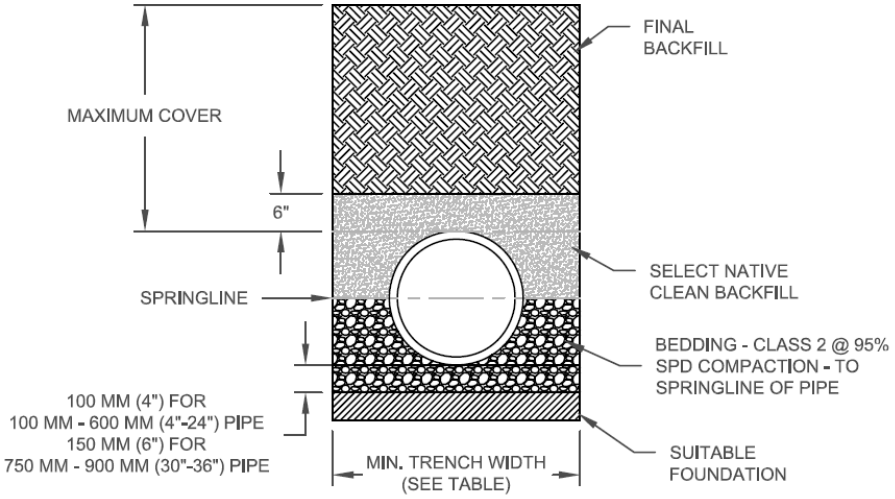

Table 2
Maximum Cover for ADS N-12 (CSA B182.8) HDPE Storm Pipe in Split Backfill, m (ft)

Diameter mm (in)	Class 3	Class 4
100 (4)	4.9 (16)	4.0 (13)
150 (6)	4.9 (16)	4.0 (13)
200 (8)	4.9 (16)	4.0 (13)
250 (10)	4.9 (16)	4.0 (13)
300 (12)	4.9 (16)	4.0 (13)
375 (15)	5.2 (17)	4.3 (14)
450 (18)	4.6 (15)	4.0 (13)
600 (24)	5.2 (17)	4.3 (14)
750 (30)	4.9 (16)	4.0 (13)
900 (36)	3.4 (11)	3.0 (10)

Notes:

1. *Results based on calculations shown in the Structures section of the ADS Drainage Handbook and CANDE analysis. Calculations assume a soil density of 120 pcf (1926 kg/m^3) for overburden material.*
2. *Backfill materials and compaction levels not shown in the table may also be acceptable. Contact ADS for further detail.*
3. *Class 2 material used below springline must be adequately placed and compacted to 95% SPD in the haunch and between corrugations. Unless otherwise noted by the engineer backfill must be compacted in 6-inch (200mm) lifts.*
4. *Select native clean backfill shall be well placed, well compacted (95% SPD) Class IV or Class III per ASTM D2321 with no foreign debris including rocks, large clumps of organic or frozen material.*
5. *For projects where cover exceeds the maximum values listed above, contact ADS for specific design considerations.*
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. *Due to element limitations within CANDE, 4"-10" cannot be analyzed. Cover height limits were taken directly from the analysis for 12" pipe.*