Introduction

Corrugated HDPE pipe, as with all buried pipe, functions as a buried structure where the performance of the structure is dependent on the quality of the embedment backfill and installation. Varying degrees of performance may be required depending on specific project details. This installation guide specifically addresses common installation methods for corrugated HDPE in agricultural applications to ensure adequate performance is achieved. Since agricultural installations do not involve pipe buried under public roadways, allowable pipe deflection may extend beyond what is typically acceptable in commercial applications.

The recommendations presented here detail proper backfill and installation methods for single wall and dual wall pipe to achieve a dependable subsurface or groundwater control system. This document should not be used for commercial applications, storm sewer applications, road crossings or where greater service performance is required. For any application outside of these basic guidelines (such as poor soils, high loads, or other factors that may affect performance), please contact your local Prinsco Representative or visit www.prinsco.com for more comprehensive installation information.

Shaped Bottom Trench

For burial depths of 8' or less, a shaped trench bottom shall be used, provided the native soil can be cut to a stable shaped trench. For trencher installations, trenches shall be overfilled to allow consolidation. For backhoe installations, the backfill should be compacted to reduce the amount of settling. Most plow installations require minimal backfilling; however, care should be taken to ensure the trench is filled and bridging does not occur. Native soil may be used as backfill provided that it can be compacted around the pipe and that all voids are removed. If native soil is not suitable for backfilling, a granular material shall be used.

"V" Groove Trench

- The 90-degree "V" groove trench bottom as shown in Figure 1 is acceptable for pipe with diameters less than or equal to 8". A "V" groove trench bottom is typically formed with a pull type or tractor mounted plow. Refer to Table 1 for approximate dimensions for a "V" groove trench.
- A trapezoidal groove or rounded trench bottom may also be used for pipe diameters less than or equal to 8".

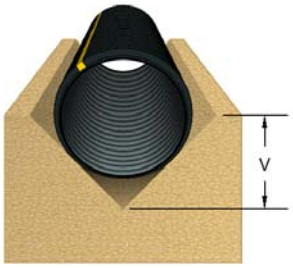

Figure 1.
3"- 8" Diameter Pipe
"V" Groove Trench

Table 1.
"V" Groove Trench Dimensions

Pipe Dia. (in)	Depth "V" (in)
3	5.1
4	6.1
5	7.2
6	8.3
8	11.1

Rounded Trench Bottom

- For pipe diameters of 8" and greater, a rounded trench bottom should be used as shown in Figure 2. The rounded trench bottom should fit the outside of the pipe, with ≤1" gap on either side of the pipe, to provide sufficient pipe support. Recommended dimensions are found in Table 2.
- A rounded trench bottom may be formed with the use of a shaped trencher or a backhoe with a half-circle shaped bucket, also referred to as a "spoon". An example of a "spoon" is shown in Figure 3.
- Burial depths greater than 8' may be achieved with a rounded bottom, provided the trench bottom offers adequate support and an imported backfill (Class I or II) is placed and compacted along the sides and extending to 6" over top of the pipe. For more information, contact your local Prinsco Representative.

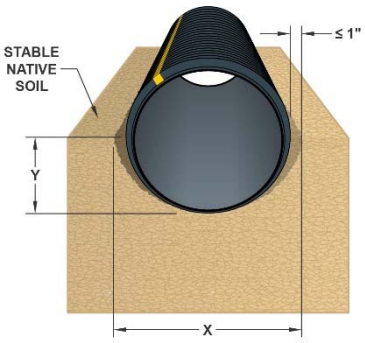

Figure 2.
8"- 60" Diameter Pipe
Rounded Trench

Table 2.
Recommended Rounded Trench Dimensions

Pipe Diameter (in)	Recommended Rounded Width "X" (in)	Minimum Depth "Y" (in)
8	9.5	4.8
10	11.8	5.9
12	14.4	7.2
15	17.6	8.8
18	21.5	10.8
24	28.3	14.2
30	34.7	17.4
36	40.6	20.3
42	47.8	23.9
48	54.2	27.1
60	66.8	33.4

Recommended widths are based on outside diameter of pipe. Gap on either side of the pipe should not exceed 1". Wider trench widths may adversely affect the pipe performance.

Figure 3. "Spoon" Attachment

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Flat Bottom Trench Construction

- For burial depths greater than 8', a flat bottom trench, shown in Figure 4, should be used. The middle portion of the bedding, equal to 1/3 of the pipe's OD, shall be loosely placed. The remainder shall be compacted in accordance with Table 3.
- The trench should be just wide enough to place and compact backfill around the entire pipe. Widths should be within a minimum of the pipe OD plus 6" to a maximum of the pipe OD plus 24".
- For parallel pipe installations, allow space between pipe runs for proper compaction. Spacing shall be no less than ½ of the pipe OD between the parallel pipe runs.
- Trench bottoms containing bedrock, soft muck or refuse, or other material unable to provide long-term pipe support are unacceptable. Poor material shall be removed and replaced with acceptable materials, excavating soft areas approximately 2' below grade and three times pipe width.
- Remove rock or unyielding material 1' below grade and a minimum of 6" on either side of pipe.
- Where soil migration is a concern, a non-woven filter fabric (geotextile) shall be used to separate the backfill from the native soil.

Table 3.
Acceptable Backfill Material and Compaction Requirements

Description	Soil Classification ASTM D2321	Soil Classification ASTM D2487	Minimum Compaction Standard Density (%)	Maximum * Layer Height (in.)
Graded or crushed stone Crushed gravel	Class I	-	Dumped**	18
Well-graded sand, gravel, and gravel/sand mixtures; Poorly graded sand, gravel and gravel/sand mixtures; little or no fines	Class II	GW GP SW SP	85%	12
Silty or clayey gravel, Gravel/sand/silt or gravel and/clay mixtures, silty or clayey sands, sand/clay or sand/silt mixtures	Class III	GM GC SM SC	90%	9
Inorganic silts and low to medium plasticity clays; gravelly, sandy, or silty clays; some fine sands	Class IVA	ML CL	90%	6

*Layer Heights should not exceed one-half the pipe diameter. Layer heights may also need to be reduced to accommodate compaction method.
** Material shall be "knifed" into the haunch area of the pipe by use of a shovel or similar means

Backfill Material Selection

- Selection of proper backfill materials is critical to ensuring adequate pipe support. Native soil may be used provided it meets the classification descriptions provided in Table 3.
- Non-cohesive sand, sand/gravel mixes and other Class II or III materials must be compacted to remove voids.
- Class IVA materials provide reduced structural support, compared with Class I, II, & III. Therefore, additional pipe deflection may be experienced in applications utilizing Class IVA backfill materials. The additional deflection is anticipated and shall not compromise service performance, provided the compaction and maximum burial depth criteria are followed as outlined in this document and in ASTM F449.

Backfill Placement and Compaction

- Place and compact backfill in layers, meeting requirements of ASTM F449 and as outlined in Table 3.
- Place and compact initial backfill in layers around pipe and at least 6" above the crown as shown in Figure 4.
- Avoid impacting pipe with compaction equipment.
- The final minimum cover shall be 2' over the crown of the pipe where live vehicular or equipment loading is present and shall be no less than 1' in areas not subjected to live loading.
- The maximum burial depth is influenced by the pipe diameter, backfill material, degree of compaction, trench dimensions and anticipated loading. Contact your local Prinsco Representative for maximum burial depths.

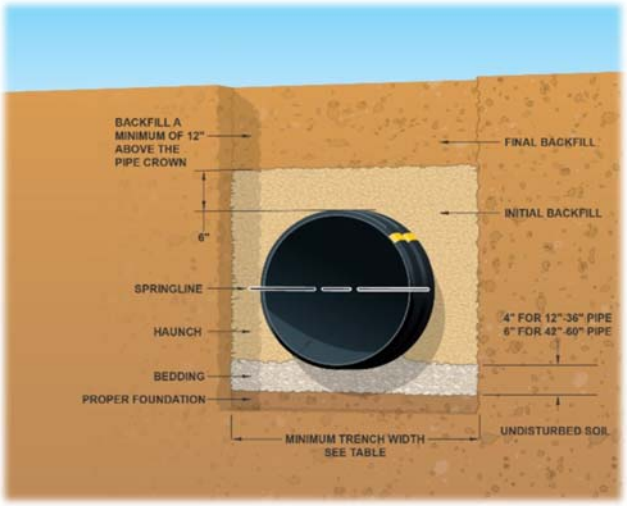

Figure 4. Trench Construction for Burial Depths Greater than 8'

Design Considerations

To achieve optimum performance, it is important to consider factors such as pipe connections, field conditions, soil type and texture, potential negative pressures, and outlet protection. Failure to consider all design aspects may result in reduced flow capacity or system failure. For more information, contact your local Prinsco Representative.

- **Connecting Dissimilar Pipe:** Drainage systems occasionally require pipe connections between HDPE and other pipe materials such as concrete, corrugated metal, or clay tile. For dissimilar pipe connections, adapters, couplers, or other fittings may be used.
- **Soil and Water Table:** For effective drainage, it is necessary to understand the soil and water table characteristics at the depth the pipe will be installed. Sand or fine silt may move into the system and restrict flow in areas with sandy soils or fluctuating water tables (due to seasonal variations, pumping, or well-pointing methods). In these situations, a non-woven filter fabric surrounding the pipe is recommended. Site specific conditions shall be determined by a geotechnical or design engineer.
- **Negative Pressure Relief:** Areas with abrupt changes in elevation may result in negative pressure, resulting in blowouts. To ease any potential negative pressure, the flatter section shall have a 25% greater flow capacity than the steep section. Relief wells shall be installed where the pipe changes from steep to flat without an increased flow capacity.
- **Outlet Protection:** Protecting the outlet against animals, fire and erosion extends the life of the system. Animal guards, rip-rap or other erosion protection, and fire resistant material in areas subject to burning are recommended at the outlet.

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