PWPipe

TECHNICAL BULLETIN

INSTALLATION **TB-I1**

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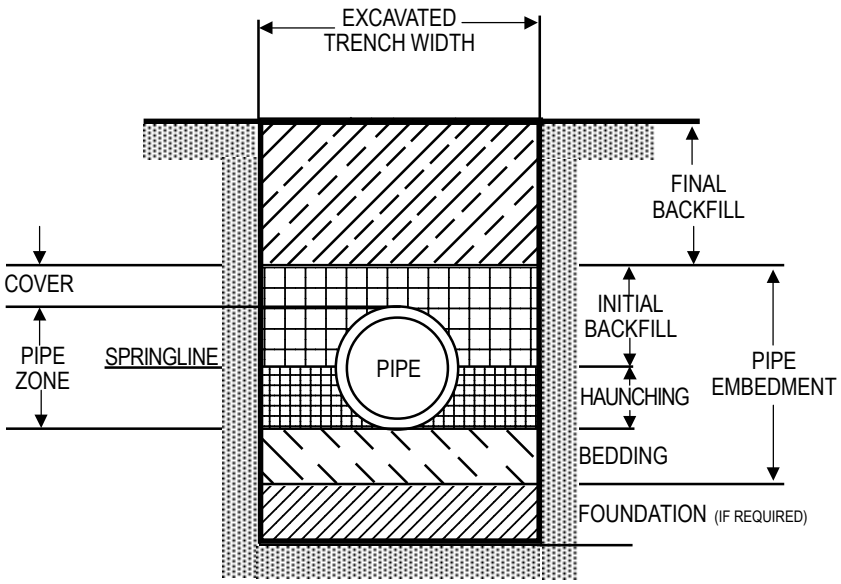
PVC Pipe Trench Construction

Figure 1: PVC Pipe Trench



Trench Terminology

As shown in Figure 1, a PVC pipe trench is separated into several zones, each with a different function:

Foundation: A foundation is necessary only when native soils are unstable. For such conditions, the trench is over-excavated and a layer of supportive material is placed and compacted to provide a firm foundation for the subsequent pipe embedment materials.

Embedment: This zone is the most important in terms of pipe performance. It is divided into the following sub-zones:

Bedding: Typically four to six inches of supportive, compacted material. This zone provides even support for the pipe and brings it to grade.

Haunching: Extends from the bottom of the pipe to the centerline of the pipe ("s*pringline*"). It provides the most resistance to pipe deflection. Specifying proper materials and compaction are most important for this zone.

Initial Backfill: Extends from the springline to a point above the top of the pipe. This zone provides some pipe support and helps to prevent damage to the pipe during placement of the final backfill. The cover extends from the top of the pipe to the top of the initial backfill. The depth of cover should be as much as necessary to protect the pipe during placement of the final backfill. Twelve inches is a common depth of cover.

Final Backfill: This zone extends from the top of the initial backfill to the top of the trench. This zone has little influence on pipe performance, but can be important to the integrity of roads and structures.

Embedment and Backfill Materials

The classifications of soil types are shown in Table 1, ranked in order from most supportive to least supportive.

Table 1: Soil Classifications[1]

Class I	Crushed rock, slag, and/or coral.
Class II	Gravel and/or sands, with little or no fines.
Class III	Sand/silt and sand/clay mixtures.
Class IV	Inorganic clays.
Class V	Organic silts, clays, and peats.

[1]As defined in ASTM D 2487 and D 2321

Classifications I, II, and III are recommended for use in the embedment zone. Class IV can also be used, but more care must be taken to achieve the desired soil density. Class V soils are not recommended for the embedment zone. All classes of soils can be used for the final backfill zone.

Particle Size

For PVC pipes 6" in diameter and greater, limit particle size in the embedment zone to 1½" or less. For pipe diameters less than 6", limit particle size in the embedment zone to ¾" or less.

For the final backfill zone, particle size should be limited to three inches or less.

Compaction

Soil density in the embedment zone, and particularly in the haunching zone, is important for limiting pipe deflection due to soil weight and live loads.

It is important that the embedment material completely surround the pipe and be free of voids.

Note: To prevent excessive pipe deflection, the haunching zone **must** be compacted **prior** to placement and compaction of initial and final backfills.

Free-flowing materials, such as sands and gravels, rarely need more than shovel slicing to achieve desired levels of density. Other soils may require the use of mechanical compactors. Compactors should be selected for the type of soil to be densified and be properly sized and operated so as to prevent pipe damage.

Trench Width

The most cost-effective trench construction is accomplished by minimizing trench width. Minimum trench widths are dictated by the amount of space necessary to ensure haunching zone materials can be completely and safely placed and compacted, while maintaining trench wall stability. Embedment material should be compacted to trench walls. Consult PWPipe's Installation Guide for trench width recommendations.

Materials with High Void Ratios

When materials with high void ratios (e.g. ¾" clean crushed rock) are used for embedment, it is possible for fines in the trench walls to migrate into the voids. This can cause some loss of support in the trench. It is therefore preferable to use materials containing some fines (e.g. ¾" minus). An alternative method is to install filter fabric in the boundary between trench and fill to prevent migration.