

Split Backfill Installations

Using a Combination of Primary and Secondary Backfill

Split Backfill Requirements!

Do:

Obtain approval from the tank owner/regulators before using.

Use clean native soil, coarse sand, gravel or other acceptable materials as shown in this as secondary backfill.

Ensure 100% of material passes through a 1-inch sieve.

Compact the secondary backfill to at least 85% Proctor density.

Use geotextile ("filter fabric") to separate primary and secondary backfill (see Table 4 for the specification)

Install in 12–24-inch layers, compatible with compaction equipment.

Address potential frost heave issues.

Documentation required – type of geotextile, native backfill type, pictures must be noted on the Installation Checklist.

Do Not:

Do not this procedure in traffic areas (H-20/HS-20).

Do not use in deep burial installations (more than 7 ft).

Do not use clay as secondary backfill.

Do not use frozen material or material with roots, large rocks, debris, ice, or snow.

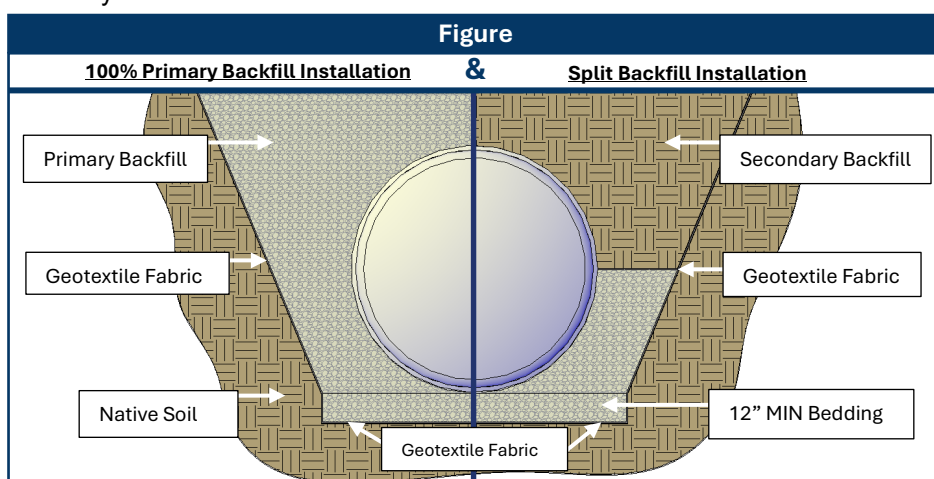
CAUTION

Do not use rammer-type compactors over the top of the tank.

Split Backfill Installations

1.0. Introduction

- 1.1. Most installations use 100% Primary Backfill when installing tanks.
- 1.2. Some projects may be eligible to use less than 100% Primary Backfill (as described in the Installation Manual and Operating Guidelines) with another material ("Secondary Backfill").
- 1.3. These installations are referred to as "Split Backfill" Installations. Refer to the "Do" and "Do Not" tables on the left side of this document before proceeding.
- 1.4. In Split Backfill Installations, after Primary Backfill has been brought to 50% of the tank diameter, the diagram below illustrates how Secondary Backfill may be utilized:



2.0. Secondary Backfill Materials

- 2.1. Typical Secondary Backfill materials are clean native soil, coarse sand, or gravel.
- 2.2. Other acceptable materials may be used as secondary backfill but may require different levels of compaction. This document defines those materials using terminology from ASTM D2487—the standard for classifying soils under the Unified Soil Classification System (USCS). Most loose (unconsolidated) materials can be identified using USCS symbols, which are two-letter codes. For example, "**GW**" stands for **well-graded gravel**. When soil mixtures are involved, a hyphen is used—for instance, "**GW-GM**" indicates **well-graded gravel with silt**.
- 2.3. Refer to Tables 1, 2 and 3 for information regarding USCS materials and compaction requirements for other acceptable materials that may be used as Secondary Backfill.

3.0 Installation

- 3.1. Use the specified Primary Backfill Material as the backfill vertically up to a point of 50% of the tank diameter. (See FIGURE 1-1.)
- 3.2. Follow the instructions in the Installation Manual on the placement of Primary Backfill.
- 3.3. In split backfill installations, place geotextile over primary backfill before adding Secondary Backfill, and ensure that joints overlap by at least 12 inches.
- 3.4. Install all Secondary Backfill in 12–24-inch layers, ensuring compatibility with compaction equipment.
- 3.5. If this procedure is used, record the type of geotextile, native backfill type, on the Installation Checklist, and take and save photos during installation.

Tables and Charts

| First Letter | Definition | Second Letter | Definition |
|--------------|------------|---------------|--|
| G | Gravel | P | Poorly Graded (uniform particle sizes) |
| S | Sand | W | Well Graded (diversified particle sizes) |
| M | Silt | H | High Plasticity |
| C | Clay | L | Low Plasticity |
| O | Organic | | |

TABLE 1 - USCS Symbols for Secondary Backfill and Bedding Materials

| Compactive Effort | Definition | Proctor Density (In-Place) | Relative Density |
|-------------------|--|----------------------------|------------------|
| Dumped | No compaction effort (self-compacting) | At least 85% | At least 40% |
| Slight | Some compactive effort required | At least 85% | At least 40% |
| Moderate | Additional compactive effort required | 85% – 95% | 40% – 70% |
| High | High level of compactive effort | At least 95% | At least 70% |

TABLE 2 – Compactive Effort and Density Requirements for Secondary Backfill Materials

| Material | Description | Compaction Requirement |
|-----------------------------|--|------------------------|
| Crushed Stone / Round Stone | Standard material (per FTS Backfill guidelines) | Dumped |
| GW, GP, SW, SP | Coarse-grained soils with < 12% fines | Slight |
| CL, ML, ML-CL (≥25% coarse) | Fine-grained soils (LL < 50), medium to no plasticity, ≥25% coarse particles | Moderate |
| GM, GP, SW, SP | Coarse-grained soils with fines | Moderate |
| CL, ML, ML-CL (<25% coarse) | Fine-grained soils (LL < 50), medium to no plasticity, <25% coarse particles | High |

TABLE 3 – Acceptable Secondary Backfill Materials & Compaction Requirement

| Specification | Value | Test Method |
|-------------------------------|---|-------------|
| Minimum Grab Tensile Strength | 120 lbs | ASTM D4632 |
| Maximum Apparent Opening Size | #50 US sieve (0.0117 in / 0.297 mm) | ASTM D4751 |
| Minimum Flow Rate | 18 gallons/min/ft ² | ASTM D4491 |
| Minimum Permittivity | 0.28 sec ⁻¹ | ASTM D4491 |
| Example Products | Mirafi 140NL, 140N, 160N, or equivalent | — |

TABLE 4 – FTS Geotextile Specifications