

29. Our applicable limited warranty contains operating guidelines and limitations that should be reviewed as applicable. Copies of our current limited warranties are found at xerxes.com.

1: PLANNING FOR INSTALLATION

1.1. GENERAL

1.1.1. This section of the *Installation Manual* contains information that you need to consider before a tank is delivered so that you are prepared to proceed with installation. This includes, but is not limited to, equipment needed for installation, backfill material selection, excavation requirements, tank anchoring options, taking diameter measurements, and onsite testing requirements.

1.1.2. The following list is to be used as a guide for equipment recommended for tank installation:

- excavation equipment capable of producing a level-bottom hole and placing backfill material at any point in the excavation
- suitable lifting equipment capable of lifting and placing the tanks and associated tank anchors
- spirit level
- transit or grade level
- 50-foot [15-meter] tape measure
- tamping rod(s)
- pipe wrenches and appropriate pipe joint compound
- a test manifold for each pressure-testable tank or compartment (reference **Figure 4-1**)
- source of pressurized air capable of 6 psig [40 kPa] or inert gas
- soap and water solution (during freezing conditions, a suitable solution such as windshield washer fluid may be added to the soap and water mixture)
- soft cloth, brush or hand-held pneumatic sprayer
- hand shovel
- lifting sling(s)
- soil compacting equipment (if necessary)

1.2. BACKFILL MATERIAL AND GEOTEXTILE

1.2.1. Tanks shall be installed using select rounded stones or crushed stones as primary backfill material. See **Backfill Sidebar** for detailed specifications.

1.2.2. Alternatively, tanks shall be installed using primary backfill vertically up to at least 75% of the tank diameter and secondary backfill above the primary backfill. This is commonly called a "split backfill" installation. See **Backfill Sidebar** for detailed specifications and **Figure 1-1**.

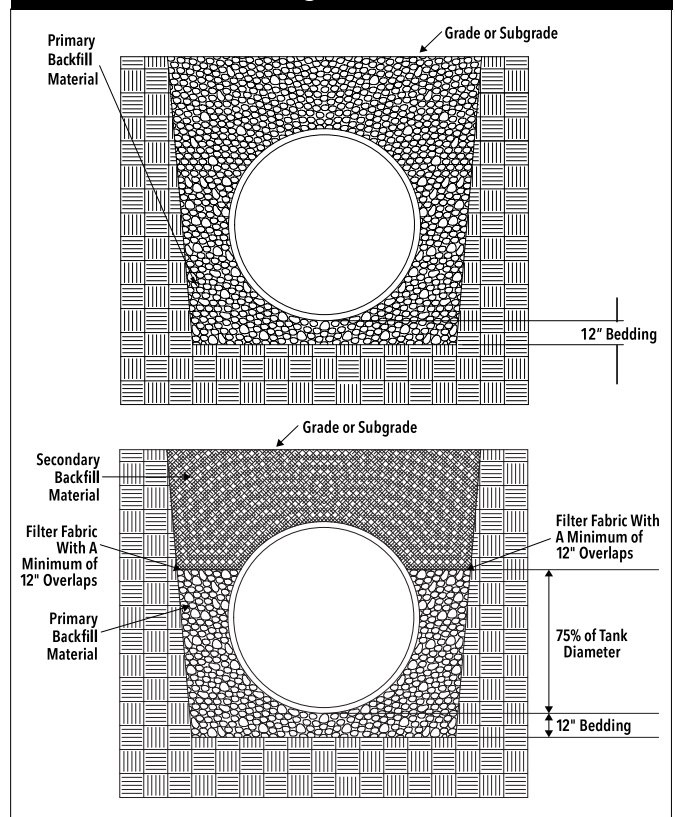
1.2.3. Using backfill material other than that specified here without prior written authorization from us will void our obligations under the applicable limited warranty.

NOTICE

Using other than specified backfill material could cause tank failure, or could result in damage to the tank and/or surrounding property.

1.2.4. It is recommended that the supplier of backfill material provide the tank installer and tank owner with written certification that the material conforms to ASTM C 33, ASTM D 448, AASHTO M 43, and any other applicable specifications.

Figure 1-1



1.2.5. If primary backfill material which meets these specifications is not available, contact eng.support@shawcor.com for information on alternate materials, installation instructions for alternate materials and the process for approval.

1.2.6. When used, secondary backfill material must meet the specifications detailed in the **Backfill Sidebar**.

1.2.7. Using geotextile fabric is considered good installation practice and using it in any installation is recommended, especially when the tank is installed in:

- areas with frequently changing groundwater conditions or areas subject to tidal fluctuations
- unstable soils such as those cited in **Section 1.3.5.3**.
- water conditions with silty in-situ soil.

1.2.8. The tank owner or the owner's technical representative is responsible for determining whether a geotextile or an alternate filtering technique is appropriate for a specific installation.

1.2.9. Geotextile helps preserve the integrity of the select backfill envelope that surrounds and supports the tank.

1.2.10. Geotextile fabric allows the passage of water in and out of the excavation but prevents the migration and mixing of in-situ soil and the select backfill material.

1.2.11. Polyethylene film is not considered an effective geotextile material because it may tear or degrade while in service.

1.2.12. If geotextile is used, install geotextile before placing bedding material.

1.2.13. Where both primary and secondary backfill are used, a layer of geotextile filter fabric must be installed over the entire surface of primary backfill material before secondary backfill is placed.

- All joints in the filter fabric must be overlapped a minimum of 12 inches [30 cm].
- Geotextile fabric must overlap onto the tank and excavation surface a minimum of 12 inches [30 ml].

1.3. EXCAVATION REQUIREMENTS

⚠ WARNING

Consult OSHA's regulations, and/or applicable Canadian federal, provincial and municipal safety codes and operational regulations, whichever are relevant. Collapse of excavation walls could result in death or serious injury.

1.3.1. GENERAL

1.3.1.1. The installing contractor must take all necessary precautions in or near a tank excavation. These precautions should include but are not limited to the following:

- Locate and protect any utility installations near the excavation before opening the excavation.
- Secure the walls of the excavation.
- Take appropriate precautions to protect against exposure to hazardous vapors from the excavation.
- Avoid hazards associated with water accumulation in the excavation.
- Erect barricades, etc., to prevent unauthorized vehicle or pedestrian traffic.
- Inspect, a minimum of once a day, the excavation and surrounding area during the entire installation process.

1.3.1.2. For additional information on excavation, trenching and shoring safety practices, consult OSHA's regulations, and/or applicable Canadian federal, provincial and municipal safety codes and operational regulations, whichever are relevant.

⚠ WARNING

Follow OSHA regulations or consult your local Canadian regulations concerning tank excavations, whichever are relevant. Collapse of excavation walls could result in death or serious injury.

1.3.1.3. The minimum clearance dimensions given in this section are important to the successful installation of a tank.

1.3.1.4. Additional clearances may be necessary due to regulations, safety requirements or operational requirements of governmental agencies. Follow all applicable regulations and safety practices.

1.3.1.5. For additional requirements and specifications, consult all codes and regulations of governmental agencies. See the Introduction for additional information.

1.3.2. EXCAVATION AND TANK LOCATION

1.3.2.1. We recommend that the tank owner seek the advice of a local foundation professional engineer to determine the proper placement of a tank excavation near any existing structure(s).

NOTICE

Improper placement of the excavation could result in damage to the tank and/or property damage.

BACKFILL SIDEBAR

GENERAL

1. Backfill is a critical part of a proper tank installation. The following are basic requirements for backfilling our tanks:

- Both primary and secondary backfill material is to be clean, free-flowing, and free of dirt, sand, large rocks, roots, organic materials, debris, ice and snow.
- No backfill material shall be frozen or contain lumps of frozen material any time during compaction or placement.

PRIMARY BACKFILL

2. Use coarse aggregate (rounded stones or crushed stones) as primary backfill material. See size requirements in drawings below.

3. Primary backfill material should be a mix of well-graded stones, generally conforming to the 6, 67, 7 and 8 sizes of ASTM's C33.

4. No more than 5% of this material can be small enough to pass through the #8 sieve.

5. Do not use materials like soft limestone, sandstone, sea shells or shale that break down over time.

SECONDARY BACKFILL

(used in split backfill installations)

6. Examples of acceptable secondary backfill material are:

- clean native backfill
- coarse sand
- gravel

7. Secondary backfill must be compact to achieve a minimum of 85% standard proctor density.

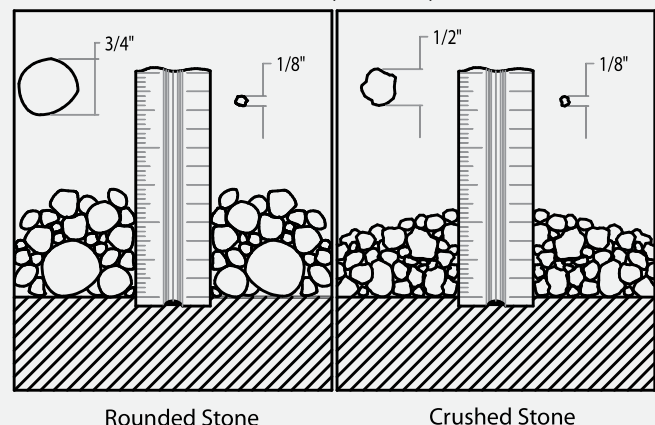
8. 100% of secondary backfill material must pass through a 1-inch [25-cm] sieve.

9. Secondary material must be installed in 12-inch [30-cm] to 24-inch [61-cm] lifts compatible with the compaction equipment used.

10. When using secondary backfill, consider potential frost-related problems to avoid frost heave.

11. Requirements of the piping, surface slab or roadway used may determine specifications for secondary backfill material and compaction above the filter-fabric layer.

12. Refer to applicable codes or standards for base course and sub-base course material and compaction requirements.



1.3.2.2. The tank owner and/or the owner's technical representative is responsible for determining the proper placement of a tank excavation.

1.3.2.3. In general terms, the size of the excavation is determined by:

- the number of tanks to be installed
- the size of the tanks to be installed

1.3.2.4. The location of a tank can be affected by the location of nearby structures. When selecting a tank site, care must be taken to avoid undermining the foundations of existing structures or new buildings to be constructed. See **Figure 1-2**.

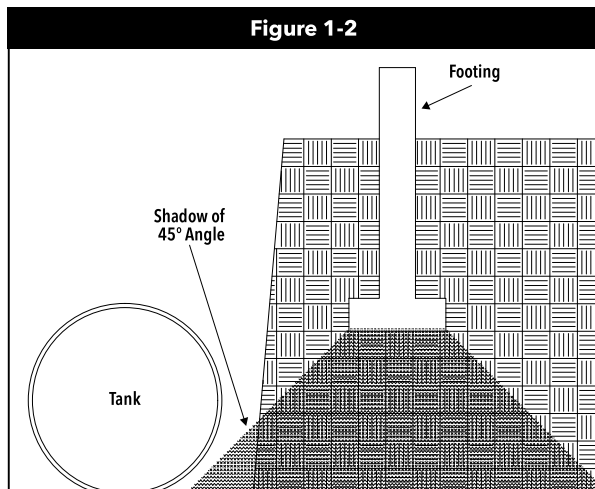
- Ensure that downward forces from loads carried by the foundations and supports of nearby structures (constructed before or after tank installation) are not transmitted to the tanks.

1.3.2.5. Typically, the way to check the placement of the tank in relationship to a nearby structure is to do the following:

- determine the depth of burial needed for the tank
- locate the footing of the structure to be considered
- determine the line that would fall into the ground from a 45-degree angle drawn downward from the corner(s) of the footing of the foundation that is closest to the tank

1.3.2.6. The tank must not fall within the "shadow" of the 45-degree angle line drawn from the foundation's footing. See **Figure 1-2**. If the tank would fall within this "shadow," do one of the following to ensure that the tank does not fall within the "shadow":

- move the tank away from the existing building
- move the foundation of the building to be constructed away from the tank
- deepen the footing of the planned building's foundation



1.3.3. DEPTH OF EXCAVATION

1.3.3.1. Typically, the depth of the excavation is determined by:

- groundwater conditions
- traffic at the site
- soft or uneven excavation base
- pipeline grade requirements and/or invert elevations
- codes and regulations

1.3.3.2. Groundwater must be considered if the level of water in the ground may rise above the bottom of the tank at any time during the life of the tank.

1.3.3.3. Traffic loads are considered to be loadings for highway vehicles up to H-20 or HS-20 as defined in the AASHTO Standard Specifications for Highway Bridges.

1.3.3.4. Excavations must allow for 12 inches [30 cm] of backfill between the bottom of the tank and the bottom of the excavation or the top of the anchor slab (or any other stabilizing materials used).

1.3.3.5. If either an anchor slab or other stabilizing material is used, allow additional depth in the excavation to accommodate their construction.

1.3.3.6. Typically, no additional depth of bedding is required for the use of a deadman anchoring system.

1.3.4. DEPTH OF COVER

⚠ CAUTION

In both traffic and nontraffic installations, no truck or equipment loads are allowed over the tank until the backfill is at least at the depth of cover specified in Table 1-1 or Table 1-2, whichever is applicable. Failure to follow this caution could result in minor or moderate injury, and/or damage to the tank.

1.3.4.1. We recommend that every site be thoroughly evaluated for the potential of a rise in the local water table or of trapped water (a wet-hole condition). Sufficient overburden and/or an appropriate anchoring system must be present to offset buoyancy of the tank in such conditions.

NOTICE

Failure to provide sufficient overburden and/or an appropriate anchoring system could cause tank failure, or could result in damage to the tank and/or surrounding property.

1.3.4.2. The tank owner or the owner's technical representative is responsible for determining sufficient overburden and/or appropriate anchoring system.

1.3.4.3. The minimum depths of cover dimensions given here are important to the successful installation of a tank. They may not be sufficient to counteract buoyancy in wet-hole conditions.

Table 1-1
Depth of Cover Minimum Requirements for Fuel Tanks
No Traffic Options (US Installations) <ul style="list-style-type: none"> • 24" [60 cm] backfill • 12" [30 cm] backfill + 4" [10 cm] reinforced concrete • 12" [30 cm] backfill + 6" [15 cm] asphalt
No Traffic Options (Canadian installations) <ul style="list-style-type: none"> • 24" [60 cm] backfill
Traffic Options (US Installations) <ul style="list-style-type: none"> • 36" [91 cm] backfill • 18" [46 cm] backfill + 6" [15 cm] reinforced concrete • 18" [46 cm] backfill + 8" [20 cm] asphalt
Traffic Options (Canadian installations) <ul style="list-style-type: none"> • 39" [99 cm] backfill • 18" [46 cm] backfill + 6" [15 cm] reinforced concrete • 18" [46 cm] backfill + 8" [20 cm] unreinforced concrete
NOTE: These are NFPA 30 and 31 and National Fire Code of Canada requirements.

1.3.4.4. Additional depths of cover may be necessary due to safety requirements or operational requirements by governmental agencies.