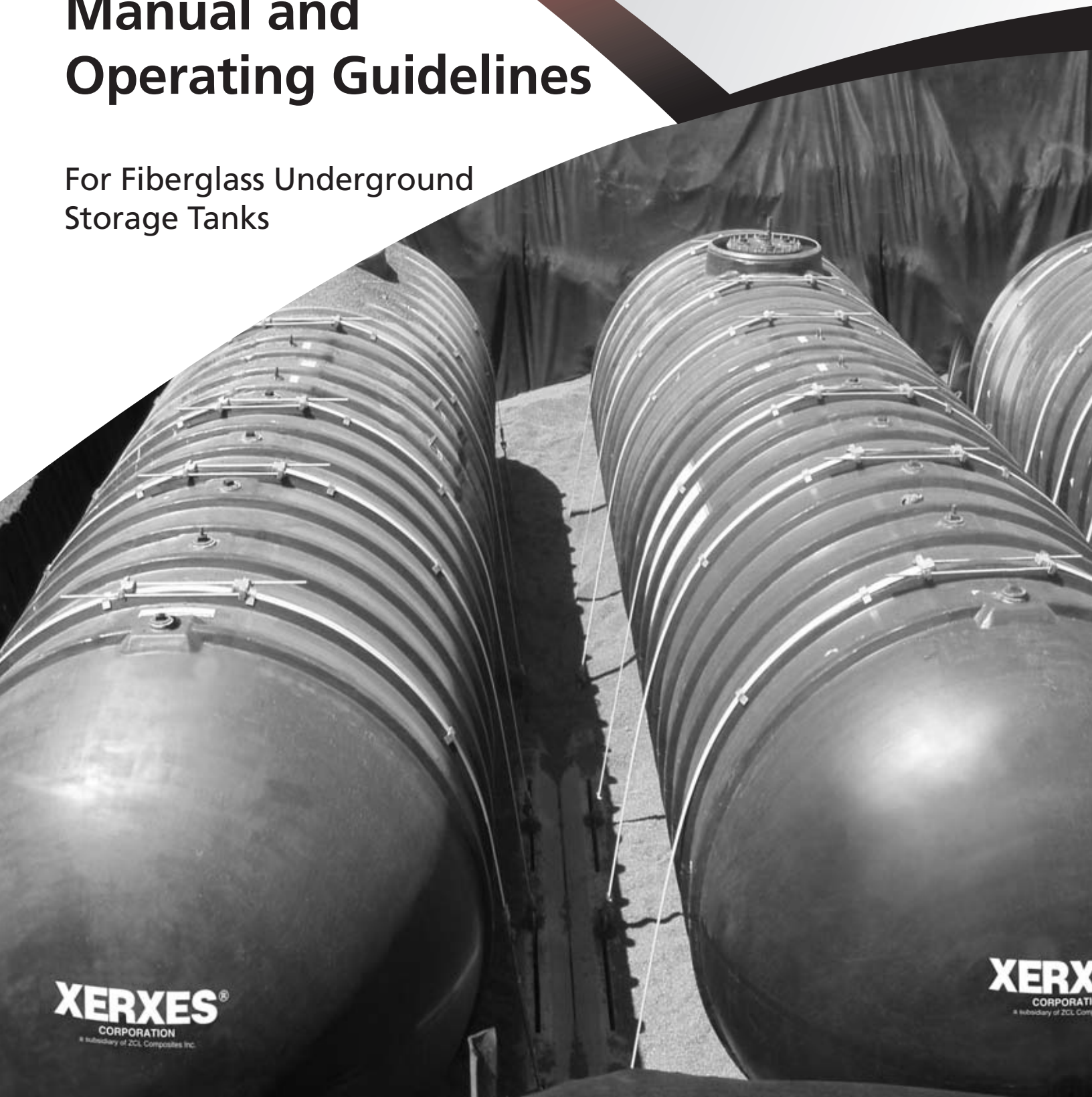
XERXES®
CORPORATION
a subsidiary of ZCL Composites Inc.

Installation Manual and Operating Guidelines

For Fiberglass Underground Storage Tanks



This installation manual covers all Xerxes single-wall, double-wall and multicompartment underground tanks. See Section 22 of this manual for supplemental material that may also apply.

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Read all instructions and operating guidelines before installation.

To Installer: Before installation, read Installation Manual and Operating Guidelines. After installation, give Installation Manual and Operating Guidelines with the completed Tank Installation Checklist to owner.

To Owner: After installation, retain Installation Manual and Operating Guidelines for future reference to operating guidelines.

1. INTRODUCTION

1.1. SAFETY

1.1.1. Before beginning the tank installation, read through the entire Installation Manual and Operating Guidelines (subsequently referred to as "Installation Manual"). It is the responsibility of the owner, installer and operator to follow all requirements contained in this Installation Manual and to comply with all federal, state and local safety regulations that may apply to tank installations and operations.

1.1.2. No instructions or procedures presented in this Installation Manual should be interpreted so as to put at risk any person's health or safety, or to harm any property or the environment.

1.1.3. The following definitions will serve as a guide when reading the Installation Manual:

⚠ WARNING

Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

CAUTION

A Caution without the safety alert symbol indicates a potentially hazardous situation, which, if not avoided, may result in property damage.

1.1.4. Keep this Installation Manual available at the installation site to refer to safety procedures as needed.

⚠ WARNING

Follow OSHA regulations for tank excavations. Collapse of excavation walls could result in death or serious injury.

1.1.5. Working in and around excavations is dangerous. The Occupational Safety and Health Administration (OSHA) has specific requirements that must be followed. Prior to beginning work at the site, the installer must obtain a copy of OSHA's Standard, Part 1926, Subpart P (Excavations), 650-652. A copy of this standard is available free of charge at OSHA's Web site (www.osha.gov).

1.1.6. Careless activity or reckless operation of equipment can cause death, serious injury or property damage.

1.2. GENERAL

1.2.1. It is important to follow the procedures and instructions in this manual in order to safely and properly install a Xerxes underground storage tank and accessories. Failure to follow these instructions will void Xerxes' obligation under the warranty and may cause tank failure, serious personal injury or property damage.

1.2.2. The Xerxes limited warranty applies only to a tank installed according to these instructions. Since Xerxes does not control the parameters of any installation, Xerxes' sole responsibility in any installation is that presented in the limited warranty.

1.2.3. It is the responsibility of the owner and operator to always follow the operating guidelines set forth in Xerxes' applicable limited warranty and SECTION 20 of this Installation Manual. A copy of the relevant Xerxes limited warranty is found in the printed material that accompanies each tank, in each applicable product brochure and on the Xerxes Web site (www.xerxescorp.com). It is also available upon request from the UST coordinator at the Xerxes plant nearest you. It is the responsibility of the owner to retain this Installation Manual for future reference to operating guidelines.

1.2.4. Use the Tank Installation Checklist (included in this manual) for all single-wall tanks (SW), double-wall tanks (DW), oil/water separators (OWS) and multicompartment tanks (MC) as the installation proceeds. Retain a copy of the completed Tank Installation Checklist and any correspondence, certification, etc., related to the tank. Each tank requires a separate Tank Installation Checklist. Consult your Xerxes representative or distributor if additional Tank Installation Checklist forms are needed.

1.2.5. The tank owner should retain a copy of the Tank Installation Checklist to facilitate any warranty claim. Xerxes recommends that the installing contractor also keep a copy.

1.2.6. Comply with all applicable regulations and standards, such as:

- federal, state and local construction, health, safety and environmental codes
- National Fire Protection Association standards (for example, NFPA 30, 30A and 31)
- industry standard practices (for example, PEI RP100, API RP1615)
- EPA reference materials (for example, "Doing It Right").

1.2.7. For additional information, contact your state, county and city storage-tank authorities, including health, fire or building departments, and environmental agencies. All work must be performed according to standard industry practices and OSHA regulations.

1.2.8. Federal, state and local codes and regulations always take precedence over a Xerxes requirement.

1.2.9. Xerxes must authorize – in writing and prior to tank installation – any variation to, or deviation from, these Installation Manual instructions.

1.2.10. All correspondence regarding variations must be retained for any warranty claim to be valid.

1.2.11. If you have questions or encounter situations not covered in this Installation Manual, contact technical support at Xerxes Minneapolis, 952-887-1890.

1.3. DEFINITIONS

1.3.1. For terms related to a typical Xerxes tank, *see FIGURE 1-1.* For terms related to a Xerxes wastewater tank, *see FIGURE 1-2.*

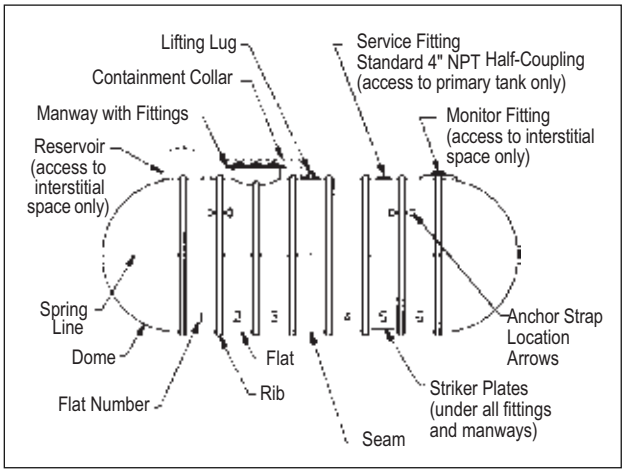


FIGURE 1-1

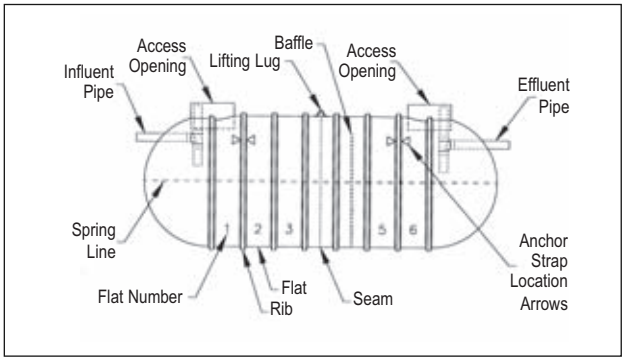


FIGURE 1-2

2. PREPARATION FOR INSTALLATION

2.1. GENERAL

2.1.1. Although Xerxes tanks are rugged, the tank owner and/or tank owner's representative must take care so that the tank is not dropped or damaged during delivery, unloading and handling on the jobsite.

2.1.1.1. Before unloading the tank from the truck, tank owner and/or tank owner's representative must make sure that all tools or other items that may damage the tank during unloading are removed from the trailer bed.

2.1.1.2. When unloading the tank from the truck, tank owner and/or tank owner's representative must make sure that the tank is secured in such a way that it does not roll off the truck.

⚠ WARNING

Do not release straps securing the tank to the truck until lifting equipment (such as a crane) is secured to the tank's lifting lug(s). Failure to do so could result in death or serious injury.

⚠ WARNING

Always chock the tank. The tank is heavy and has a large surface area. The tank will roll on sloped surfaces and could be blown about by the wind. Movement of the tank could result in death or serious injury.

2.1.2. Before the tank is unloaded or relocated on the job site (and before preinstallation testing at job site), tank owner and/or tank owner's representative must complete the following steps:

2.1.2.1. Visually inspect the entire exterior surface of the tank to make sure that no shipping or handling damage has occurred. Look particularly for holes, cracks or deep scrapes.

2.1.2.2. Sign the shipping papers accepting the tank as delivered.

2.1.2.3. Be sure that all equipment used to lift the tank is rated to handle the load. Refer to the Tank Handling Data section at the end of the Installation Manual to determine the weight of the tank and to select the proper lifting equipment.

2.1.2.4. Select a solid, level area to place the tank, and clear that area of all rocks, trash and debris.

2.1.3. When hoisting the tank, follow these instructions: *(See FIGURE 2-1 and FIGURE 2-2.)*

2.1.3.1. When the tank is not rotated (the tank is upright), use all lifting lugs to unload and install the tank. *(See FIGURE 2-2.)*

2.1.3.2. Some tanks are rotated on the truck for shipping purposes. These tanks have extra lifting lug(s) to aid in the loading/unloading process. *(See FIGURE 2-2.)*

2.1.3.2.1. To unload these tanks, use the lifting lugs that are situated on top of the tank in its rotated position. To install the tank, carefully rotate the tank to its upright position and then use all lifting lugs situated on top of the tank in its upright position. *(See FIGURE 2-2.)*

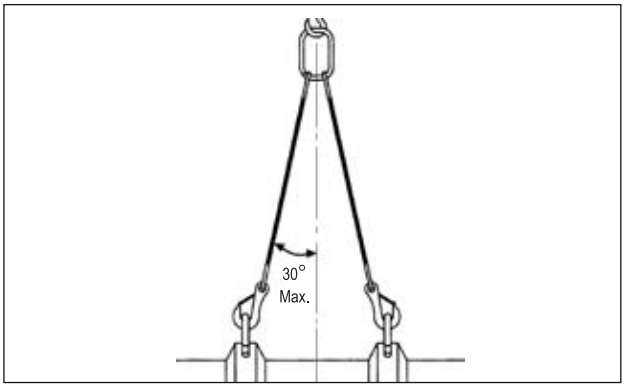


FIGURE 2-1

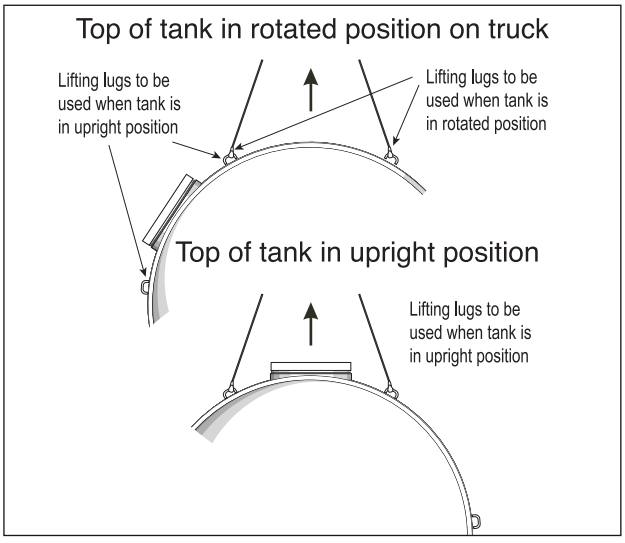


FIGURE 2-2

2.1.3.3. Do not wrap chain or cable around the tank.

2.1.3.4. Use guy ropes to guide the tank when needed.

2.1.3.5. Do not roll the tank to move it.

2.1.3.6. When handling a tank with a bottom sump or fitting, always take extra care so that the bottom sump or fitting is not damaged by contact with any other object, such as the truck bed or the ground.

2.1.4. Whenever a tank is temporarily placed aboveground at the site, chock it in place to prevent rolling. *(See FIGURE 2-3.)* Tie the tank down if high winds are expected.

2.1.5. Whenever a tank is temporarily placed aboveground at the site, always take extra care so water does not enter the collar. Xerxes recommends that the tank be rotated and/or the collar covered.

CAUTION

If water enters the collar, it could freeze and may cause damage to the tank or collar.

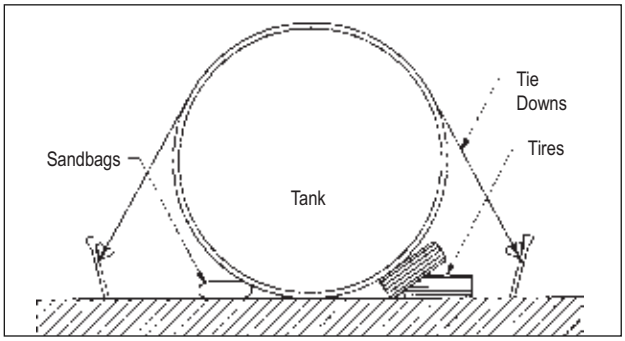


FIGURE 2-3

3. GENERAL PREINSTALLATION INSPECTION & TESTING

⚠ WARNING

Always secure the tank before moving, rotating or lifting it. This is commonly done by connecting a crane or backhoe to the lifting lugs. Failure to do so could result in death or serious injury.

⚠ WARNING

While moving or lifting the tank, do not position any part of your body underneath the tank. Failure to follow this warning could result in death or serious injury.

⚠ WARNING

Do not lift or hoist a tank under pressure. This could result in death or serious injury.

3.1. INSPECTING TANKS

3.1.1. Xerxes tanks are inspected prior to shipment, but the tank must also be inspected at the site prior to installation in order to verify the absence of shipping and handling damage.

3.1.2. Thoroughly inspect the outside of the tank for signs of damage. Rotate or lift the tank to inspect the bottom of the tank.

3.1.3. If damage is detected, do not attempt repairs. Contact the UST coordinator at the Xerxes plant nearest you. Telephone and fax numbers are found on the back cover of this manual.

3.1.4. If the tank is a wastewater tank equipped for optional preinstallation testing, follow procedures in the Xerxes supplement, Preinstallation Testing Instructions (for Wastewater Tanks Factory-Equipped for Pressure-Testing). *(See Point 22.1.1.1.)*

3.2. GENERAL PRETESTING PROCEDURES

⚠ WARNING

Do not conduct preinstallation testing while the tank is on a trailer. Failure to follow this warning could result in death or serious injury.

CAUTION

Never pressurize a wet interstitial space. Doing so may damage the primary tank or cause tank failure.

3.2.1. *See SECTION 4* for air-testing instructions for specific tank types.

3.2.2. Xerxes tanks are tested prior to shipment, but they should be retested at the site prior to installation – even if shipped with the optional vacuum in the interstitial space or wet interstitial space – in order to verify the absence of shipping and handling damage.

3.2.2.1. Not all Xerxes tanks are air-testable in the field. If a tank needs to be hydrostatically tested, *see SECTION 11.*

3.2.2.2. All petroleum tanks with a UL label and all potable water tanks must be air tested prior to installation.

3.2.3. Someone must be with the tank at all times during air testing.

⚠ WARNING

When the tank is under pressure, the manways, access openings and/or fittings may dislodge, or the tank could rupture and result in death or serious injury. Before beginning the air test, notify all people on the test site to remain in a safe location. ALWAYS ATTEND TO THE TANK DURING THE AIR TEST. Stand clear of manways, fittings and tank ends during the test.

⚠ WARNING

The maximum test pressure is 5 psig [3 psig for a 12-foot-diameter tank]. Do not exceed these pressures. Position the pressure gauges so that the pressure readings can be clearly read at all times. Failure to follow this warning could result in death or serious injury. *(See FIGURE 3-2.)*

3.2.4. The tester is responsible for verifying that all of the test equipment is in good working condition, and is properly configured and calibrated.

3.3. PREPARING THE TANK FOR AIR TESTING

3.3.1. Construct a test manifold with two air-supply gauges *as shown in FIGURE 3-1*. Each air-supply gauge must have a maximum full-scale reading of 15 psig with 1/4-lb. or 1/10-lb. increments, and a pressure-relief device set at 6 psig [4 psig for 12-foot-diameter tanks].

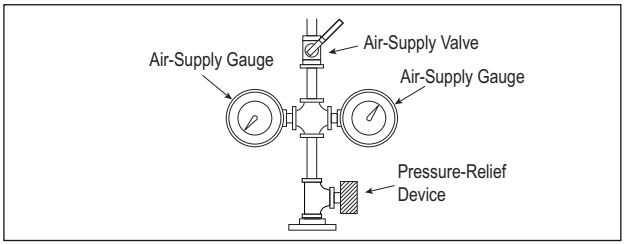


FIGURE 3-1

⚠ WARNING

The pressure-relief device or regulated air source must be rated at a maximum of 6 psig [4 psig for a 12-foot-diameter tank] to reduce the risk of overpressurizing the tank. *(See FIGURE 3-2.)* Failure to follow this warning could result in death or serious injury.

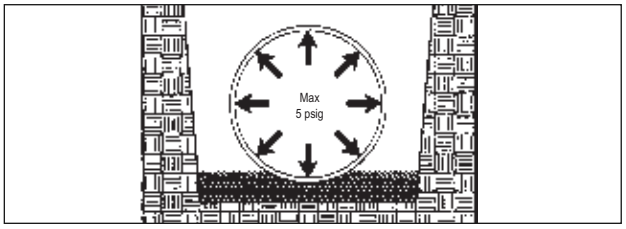


FIGURE 3-2

3.3.1.1. When testing multicompartment tanks, a test manifold is needed for each compartment.

3.3.1.2. During air tests, temperature change could be a factor in changes in gauge readings.

3.3.2. When testing tanks with a reservoir, remove the reservoir-fitting plug.

3.3.3. If the tank has threaded fittings, it is the installer's responsibility to select a thread sealant that is compatible with the product being stored. Some sealants cannot be used with some stored products.

3.3.4. Install permanent plugs in all openings where piping will not be installed.

3.3.5. Make sure all manway bolts are tightened, and fitting plugs are properly doped and sealed.

3.3.5.1. The tank may be air tested with the factory-supplied temporary plugs. Redope and tighten temporary plugs if needed.

3.3.6. Keep one service fitting open in each compartment for the test manifold.

3.3.7. Tanks equipped with flanged nozzles may require contractor-supplied blind flanges for preinstallation air testing.

3.4. PRESSURIZING THE PRIMARY COMPARTMENT

3.4.1. Install the test manifold in the open service fitting and connect the pressure source to the test manifold. *(See FIGURE 3-3.)*

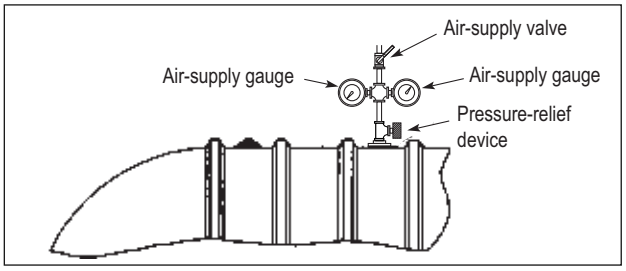


FIGURE 3-3

3.4.2. Pressurize the primary compartment to 5 psig [3 psig for a 12-foot-diameter tank]. Allow the pressure to stabilize by adding or removing air as necessary.

3.4.3. Close the air-supply valve on the test manifold and disconnect the air-supply line.

3.5 PRESSURIZING THE INTERSTITIAL SPACE IN A DRY TANK

⚠ WARNING

Never lift or hoist a tank under pressure. This could result in death or serious injury.

3.5.1. Tanks with a dry interstitial space come with a quick-disconnect assembly. *(See FIGURE 3-4.)*

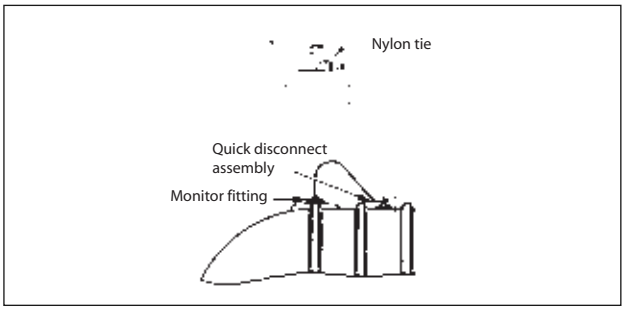


FIGURE 3-4

3.5.1.1. If the tank is not configured *as shown in FIGURE 3-4* prior to preinstallation testing, call the UST coordinator at the Xerxes plant nearest you.

3.5.2. The quick-disconnect assembly must not be connected to the service fitting when air testing the primary compartment. Keep the nylon tie in place.

3.5.3. Maintain the pressure in the primary compartment.

CAUTION

Do not connect the air supply directly to the interstitial-space monitor fitting. Pressurizing the secondary tank (interstitial space) by itself may damage the primary tank or cause tank failure.

3.5.4. Free the hose from the service fitting by cutting the nylon tie.

3.5.5. Insert the hose into the quick-disconnect fitting. This will allow air to transfer from the primary tank to the secondary tank.

3.5.6. Reconnect the air-supply line. Allow the pressure to stabilize at 5 psig by adding or removing air as necessary.

3.5.7 Close the air-supply valve on the test manifold and disconnect the air-supply line.

3.6. SOAPING THE TANK

3.6.1. After pressurizing the tank, soap the tank to check for leaks.

3.6.1.1. Soap either the fittings and manway, or soap the entire exterior of the tank, depending on what part of the testing process the tester is at and what kind of tank is being air tested. *(See instructions for specific types of tanks in SECTION 4.)* Watch for active air bubbles, which indicate a leak.

3.6.2. When checking a tank for leaks during an air/soap test, rotate the tank to check the bottom. **Do not rotate a tank filled with monitoring fluid.**

3.6.2.1. Before rotating the tank during an air/soap test, place protective material on the area on which the tank will be rotated. Make sure the area is flat and free of large or sharp objects, such as rocks, which may damage the tank.

3.6.2.2. Rotate the tank slowly and carefully to avoid developing too much momentum. Momentum can grow because manways and fittings on top of the tank make it top heavy. Make sure the tank's fittings and manways never touch the ground. Do not rotate the tank more than 120 degrees from the initial starting point.

3.6.3. If damage is detected, do not attempt repairs. Contact the UST coordinator at the Xerxes plant nearest you. Telephone and fax numbers are found on the back cover of this manual.

3.7. PERFORMING PRETEST CHECKS ON A TANK WITH A WET INTERSTITIAL SPACE

CAUTION

Never pressurize a wet interstitial space. Doing so may damage the primary tank or cause tank failure.

CAUTION

Never rotate a tank filled with monitoring fluid.

3.7.1. When air testing a tank with a wet interstitial space, keep the tank vertical (the reservoir on top) at all times or the monitoring fluid may drain from the reservoir. *(See FIGURE 3-5.)*

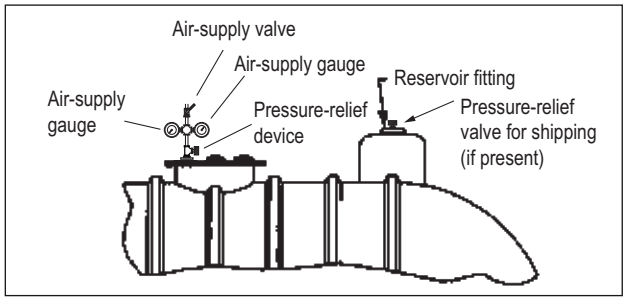


FIGURE 3-5

3.7.2. Check that the tank has monitoring fluid in the reservoir. Mark the level of the monitoring fluid in the reservoir.

3.7.2.1. Remove the pressure-relief valve used for shipping if present.

3.7.3. Visually check the interior of the tank for monitoring fluid. There should not be any.

3.7.3.1. When checking a multicompartment tank, inspect each compartment for monitoring fluid.

3.8. PERFORMING POST-TEST CHECKS ON A TANK WITH A WET INTERSTITIAL SPACE

3.8.1. Check the level of the monitoring fluid in the reservoir. It should be at approximately the same level as the pretest level.

3.8.2. Check the exterior of the tank for monitoring fluid. (The monitoring fluid is dyed blue to distinguish between moisture and monitoring fluid.) If monitoring fluid is found, wipe the tank dry and verify that the monitoring fluid does not reappear. Lift the tank to check the bottom. **Do not roll the tank.**

3.8.3. Visually check the interior of the tank for monitoring fluid. **There should not be any.**

3.9. RELEASING PRESSURE FROM THE TANK

3.9.1. If there is a secondary tank to pressurize, carefully release the air pressure in the secondary tank first.

3.9.2. If the tank is a multicompartment tank, carefully release the air pressure in the end tanks first.

3.9.3. Then carefully release the air pressure from the primary tank.

CAUTION

Never allow the pressure in the secondary tank to be greater than the pressure in the primary tank. Failure to follow this caution may damage the primary tank or cause tank failure.

⚠ WARNING

Never remove the service-fitting plugs when there is pressure in the tank. Failure to follow this warning could result in death or serious injury.

3.9.4. Remove the test manifold and replace the protective covers in the service fittings.

4. PREINSTALLATION TESTING OF SPECIFIC TANK TYPES

4.1. AIR TESTING A SINGLE-WALL TANK

4.1.1. When air testing a tank, follow the procedures outlined in SECTION 3 for the following steps.

4.1.2. Prepare the tank for air testing. *(See SECTION 3.3.)*

4.1.3. Pressurize the tank. *(See SECTION 3.4.)*

4.1.4. Soap the entire exterior of the tank, checking for leaks. *(See SECTION 3.6.)*

4.1.5. Monitor the pressure for one hour.

4.1.6. Carefully release the air pressure from the tank. *(See SECTION 3.9.)*

4.1.7. Remove the test manifold and replace the protective covers in the service fittings.

4.2. AIR TESTING A DRY DOUBLE-WALL TANK

4.2.1. When air testing a tank, follow the procedures outlined in SECTION 3 for the following steps.

4.2.2. Prepare the tank for air testing. *(See SECTION 3.3.)*

4.2.3. Pressurize the primary tank. *(See SECTION 3.4.)*

4.2.4. Soap all service fittings and manways, checking for leaks. *(See SECTION 3.6.)*

4.2.5. Monitor the pressure in the primary tank for one hour.

4.2.6. Use the quick-disconnect assembly to pressurize the interstitial space. *(See SECTION 3.5.)*

4.2.7. Soap the entire exterior of the tank, checking for leaks. *(See SECTION 3.6.)*

4.2.8. Monitor the pressure in the interstitial space for one hour.

4.2.9. Carefully release the air pressure from the tank. *(See SECTION 3.9.)*

4.2.10. Remove the test manifold and replace the protective covers in the service fittings.

4.3. AIR TESTING A WET DOUBLE-WALL TANK

CAUTION

Never pressurize a wet interstitial space. Doing so may damage the primary tank or cause tank failure.

4.3.1. When air testing a tank, follow the procedures outlined in SECTION 3 for the following steps.

4.3.2. Prepare the tank for air testing. *(See SECTION 3.3.)*

4.3.3. Do the pretest checks for monitoring fluid. *(See SECTION 3.7.)*

4.3.4. Pressurize the primary tank. *(See SECTION 3.4.)*

4.3.5. Soap all service fittings and manways, checking for leaks. *(See SECTION 3.6.)*

4.3.5.1. Check the reservoir for bubbles in the monitoring fluid. The monitoring fluid level will rise during the air test. It may even overflow from the reservoir.

4.3.6. Monitor the pressure in the primary tank for one hour.

4.3.7. Carefully release the air pressure from the tank. *(See SECTION 3.9.)*

4.3.8. Remove the test manifold.

4.3.9. Do the post-test checks on a tank with a wet interstitial space. *(See SECTION 3.8.)*

4.3.10. Replace the protective covers in the service fitting and the reservoir fitting.

4.4. AIR TESTING A SINGLE-WALL MULTICOMPARTMENT TANK WITH A SINGLE-WALL BULKHEAD

4.4.1. When air testing a tank, follow the procedures outlined in SECTION 3 for the following steps.

4.4.2. Prepare the tank for air testing. *(See SECTION 3.3.)*

4.4.2.1. Install a test manifold in each compartment, that is, in the base tank and each end tank. *(See FIGURE 4-1.)*

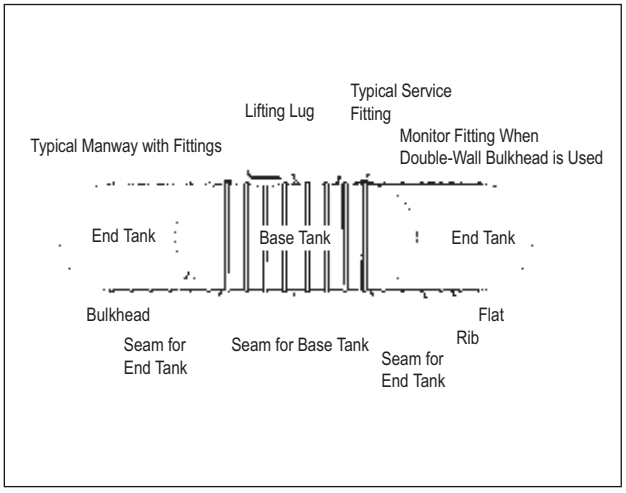


FIGURE 4-1

4.4.3. Pressurize the base tank. *(See SECTION 3.4. and FIGURE 4-2.)*

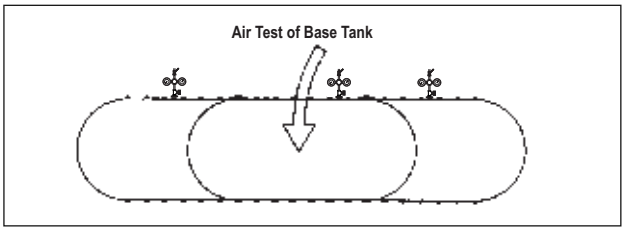


FIGURE 4-2

4.4.4. Monitor the pressure in the base tank for one hour. **Do not release the air pressure at this time.**

4.4.5. Pressurize the end tank(s). *(See SECTION 3.4. and FIGURE 4-3.)*

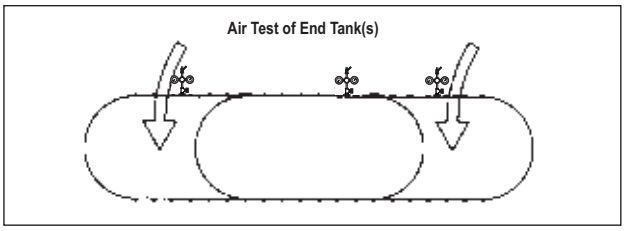


FIGURE 4-3

4.4.6. Soap the entire exterior of the tank, checking for leaks. *(See SECTION 3.6.)*

4.4.7. Monitor the pressure for one hour.

4.4.8. Carefully release the air pressure from the tank. *(See SECTION 3.9.)*

4.4.9. Remove the test manifolds and replace the protective covers in the service fittings.

4.5. AIR TESTING A SINGLE-WALL MULTICOMPARTMENT TANK WITH A DOUBLE-WALL BULKHEAD

4.5.1. When air testing a tank, follow the procedures outlined in SECTION 3 for the following steps.

4.5.2. Prepare the tank for air testing. *(See SECTION 3.3.)*

4.5.2.1. Install a test manifold in each compartment, that is, in the base tank and each end tank. *(See FIGURE 4-1.)*

4.5.3. Pressurize the base tank. *(See SECTION 3.4. and FIGURE 4-2.)*

4.5.4. Monitor the pressure for one hour. **Do not release the air pressure at this time.**

4.5.5. Pressurize the end tank(s). *(See SECTION 3.4. and FIGURE 4-3.)*

4.5.6. Install a 4-inch NPT plug with a 0-15 psig gauge (1/4-lb. or 1/10-lb. increments) into each monitor fitting leading into the double-wall bulkhead(s). *(See FIGURE 4-4.)*

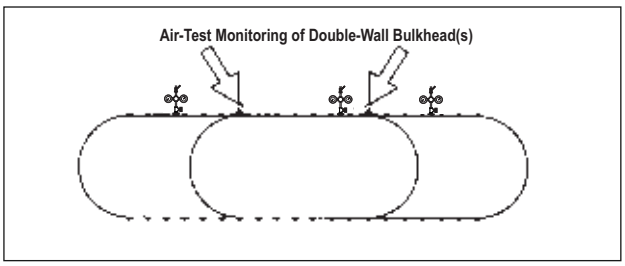


FIGURE 4-4

4.5.7. Soap the entire exterior of the tank, checking for leaks. *(See SECTION 3.6.)*

4.5.8. Monitor the pressure for one hour by monitoring all gauges for either a loss in pressure from the tanks or an increase in pressure in the bulkhead interstitial space.

4.5.9. Carefully release the air pressure from the tank. *(See SECTION 3.9.)*

4.5.10. Remove the test manifolds and replace the protective covers in the service fittings.

4.6. AIR TESTING A DOUBLE-WALL MULTICOMPARTMENT TANK WITH A DRY INTERSTITIAL SPACE

CAUTION

Do not connect air supply directly to the interstitial-space monitor fitting. Pressurizing the secondary tank (interstitial space) by itself may damage the primary tank or cause tank failure.

4.6.1. When air testing a tank, follow the procedures outlined in SECTION 3 for the following steps.

4.6.2. Prepare the tank for air testing. *(See SECTION 3.3.)*

4.6.2.1. Install a test manifold in each compartment, that is, in the base tank and each end tank. *(See FIGURE 4-5.)*

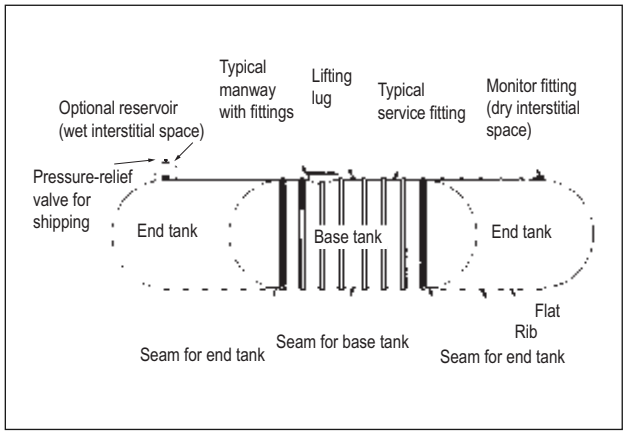


FIGURE 4-5

4.6.3. Pressurize the base tank. *(See SECTION 3.4. and FIGURE 4-6.)*

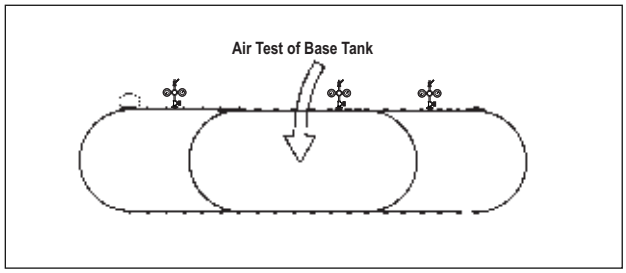


FIGURE 4-6

4.6.4. Monitor the pressure for one hour. **Do not release the air pressure at this time.**

4.6.5. Pressurize the end tank(s). *(See SECTION 3.4. and FIGURE 4-7.)*

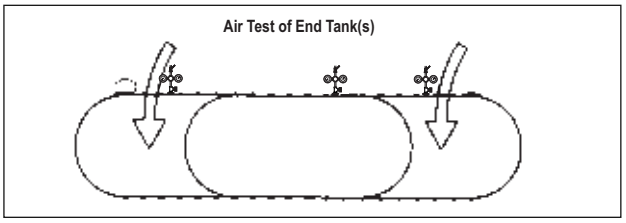


FIGURE 4-7

4.6.6. Soap all service fittings and manways, checking for leaks. *(See SECTION 3.6.)*

4.6.7. Monitor the pressure for one hour.

4.6.8. Use the quick-disconnect assembly to pressurize the interstitial space. *(See SECTION 3.5. and FIGURE 4-8.)*

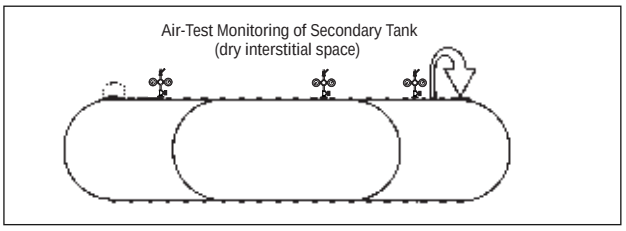


FIGURE 4-8

4.6.9. Soap the entire exterior of the tank, checking for leaks. *(See SECTION 3.6.)*

4.6.10. Monitor the pressure for one hour.

4.6.11. Carefully release the air pressure from the tank. *(See SECTION 3.9.)*

4.6.12. Remove the test manifold and replace the protective covers in the service fittings.

4.7. AIR TESTING A DOUBLE-WALL MULTICOMPARTMENT TANK WITH A WET INTERSTITIAL SPACE

CAUTION

Never pressurize a wet interstitial space. Doing so may damage the primary tank or cause tank failure.

4.7.1. When air testing a tank, follow the procedures outlined in SECTION 3 for the following steps.

4.7.2. Prepare the tank for air testing. *(See SECTION 3.3.)*

4.7.2.1. Install a test manifold in each compartment, that is, in the base tank and each end tank. *(See FIGURE 4-5.)*

4.7.3. Do the pretest checks for monitoring fluid. *(See SECTION 3.7.)*

4.7.4. Pressurize the base tank. *(See SECTION 3.4. and FIGURE 4-6.)*

4.7.5. Soap all service fittings and manways, checking for leaks. *(See SECTION 3.6.)*

4.7.6. Monitor the pressure for one hour. **Do not release the air pressure at this time.**

4.7.7. Pressurize the end tank(s). *(See SECTION 3.4. and FIGURE 4-7.)*

4.7.8. Soap all service fittings and manways, checking for leaks. *(See SECTION 3.6.)*

4.7.8.1. Check the reservoir for bubbles in the monitoring fluid. The monitoring fluid level will rise during the air test. It may even overflow from the reservoir.

4.7.9. Monitor the pressure for one hour.

4.7.10. Carefully release the air pressure from the tank. *(See SECTION 3.9.)*

4.7.11. Remove the test manifolds.

4.7.12. Do the post-test checks on a tank with a wet interstitial space. *(See SECTION 3.8.)*

4.7.13. Replace the protective covers in the service fittings and the reservoir fitting.

5. BACKFILL MATERIAL

5.1. GENERAL

5.1.1. Xerxes tanks must be installed using either pea gravel or crushed stone as backfill material.

5.1.2. Using other than approved bedding and backfill materials without prior written authorization from Xerxes will void Xerxes' obligations under the warranty.

CAUTION

Use of unapproved backfill material may cause tank failure, or damage the tank or surrounding property.

5.1.3. Approved backfill material must meet the following specifications:

5.1.3.1. The material is washed, free-flowing, and free of ice, snow and debris.

5.1.3.2. When using pea gravel, the material is to be a mix of rounded particles, sizes between 1/8 inch and 3/4 inch. *(See FIGURE 5-1.)* The pea gravel must conform to the specifications of ASTM C-33, paragraph 9.1, sizes 6, 67 or 7.

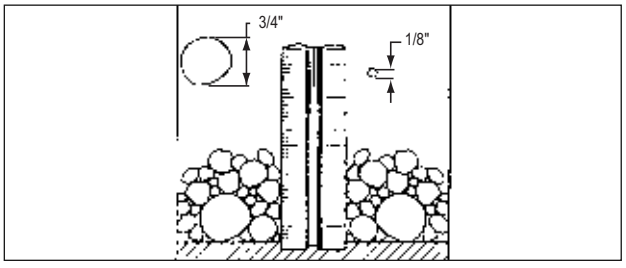


FIGURE 5-1

5.1.3.3. When using crushed stone, the material is to be a mix of angular particles, sizes between 1/8 inch and 1/2 inch. *(See FIGURE 5-2.)* The crushed stone must conform to the specifications of ASTM C-33, paragraph 9.1, sizes 7 or 8.

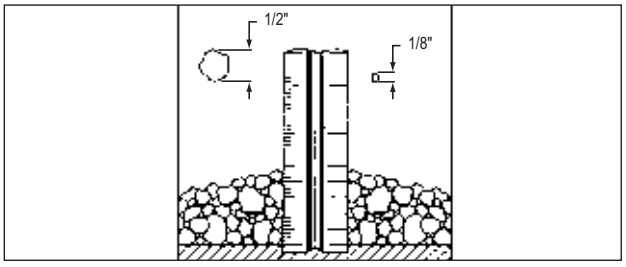


FIGURE 5-2

5.1.3.4. No more than 5% (by weight) of the material may pass through a #8 sieve.

5.1.3.5. It is recommended that the materials supplier certifies that the material conforms to ASTM C-33 and any other applicable specifications.

5.1.3.6. An important characteristic of good backfill material is hardness or stability when exposed to water or loads. Most materials have no problems meeting the hardness requirement. Materials like soft limestone, sandstone, sea shells or shale should not be used as backfill because they may break down over time.

5.1.4. For additional information, refer to the Xerxes document, Backfill Guidelines.

5.1.5. If material which meets these specifications is not available, contact technical support at Xerxes Minneapolis for information on alternate materials and the process for approval.

6. EXCAVATION PARAMETERS

⚠ WARNING

Follow OSHA regulations for tank excavations. Collapse of excavation walls could result in death or serious injury.

6.1. GENERAL

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

6.1.1.1. Locate and protect any utility installations near the excavation before opening the excavation.

6.1.1.2. Secure the walls of the excavation.

6.1.1.3. Prevent exposure of employees to hazardous fumes from the excavation.

6.1.1.4. Protect employees from hazards associated with water accumulation in the excavation.

6.1.1.5. Erect barricades, etc., to prevent unauthorized vehicle or pedestrian traffic.

6.1.1.6. Inspect, a minimum of once a day, the excavation and surrounding area.

6.1.2. For additional information on excavation, trenching and shoring safety practices, consult OSHA's Standard, Part 1926, Subpart P (Excavations), 650-652; and "Fall Protection Rules and Regulations."

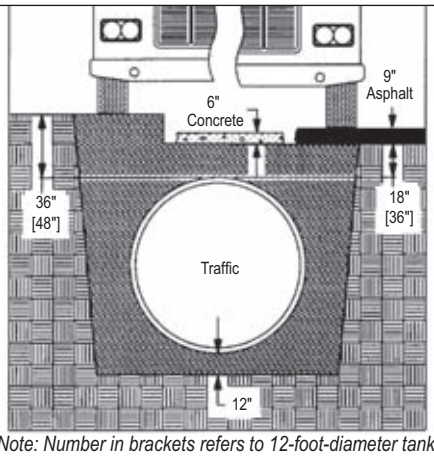
6.2. BURIAL DEPTH

6.2.1. The minimum depth of the excavation is normally determined by the presence or absence of groundwater and the presence or absence of traffic at the site. These dimensions are critical to the successful installation of a tank and are often regulated by code.

6.2.2. For additional requirements and specifications, *refer to* federal, state and local codes; NFPA 30, 30A and 31; API RP 1615; PEI RP100; and *FIGURE 6-1 and FIGURE 6-2.*

6.2.3. In all cases, the depths of cover given in 6.2.3.1. and in 6.2.3.2. are minimums.

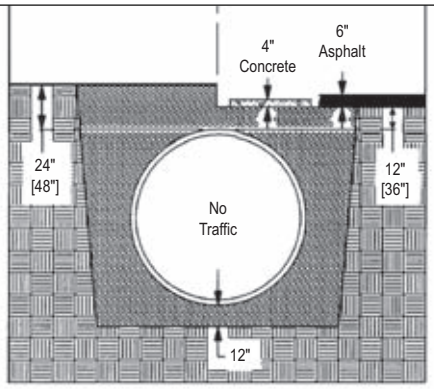
6.2.3.1. Tanks subjected to traffic loads (H-20 loads) must have a cover depth of at least 36 inches of backfill [48 inches for 12-foot-diameter tanks], or 18 inches of backfill [36 inches for 12-foot-diameter tanks] plus 6 inches of reinforced concrete or 9 inches of asphalt. *(See FIGURE 6-1.)* **In a wet condition, sufficient overburden and/or an appropriate anchoring system must be present to offset buoyancy of the tank.**



Note: Number in brackets refers to 12-foot-diameter tanks.

FIGURE 6-1

6.2.3.2. Tanks not subjected to traffic loads must have a cover depth of at least 24 inches of backfill [48 inches for 12-foot-diameter tanks], or 12 inches of backfill [36 inches for 12-foot-diameter tanks] plus 4 inches of reinforced concrete or 6 inches of asphalt. *(See FIGURE 6-2.)* **In a wet condition, sufficient overburden and/or an appropriate anchoring system must be present to offset buoyancy of the tank.**



Note: Number in brackets refers to 12-foot-diameter tanks.

FIGURE 6-2

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

⚠ WARNING

In a nontraffic installation, ensure that the areas above the tanks are not subjected to traffic or other types of loads, which could cause tank damage and result in death or serious injury.

6.2.3.4. The maximum burial depth is 7 feet of cover over the top of the tank. Deviation from this may be permissible with prior written authorization from Xerxes. Call your Xerxes representative for a special quotation prior to tank purchase if the burial depth is to be greater than 7 feet.

6.2.3.5. Asphalt and concrete pads must extend a minimum of 12 inches beyond the tank in all directions.

6.2.3.6. If there is an unattached manway riser, it must not transmit load from the concrete slab to the tank. A minimum space of 6 inches must exist between the bottom of the riser and the top of the tank.

6.2.3.7. Traffic loads from the top slab must not be transmitted to an attached sump or riser. A minimum space of 3 inches must exist between the riser or sump and the slab. *(See SECTION 18.)*

6.3. TANK SPACING

6.3.1. GENERAL

6.3.1.1. The following are minimum spacings and must be increased as needed to accommodate deadmen or anchor slabs. *(See SECTION 7.)*

6.3.1.2. Always provide sufficient clearance to allow the deadmen to be set outside of the tank "shadow." *(See FIGURE 6-3.)*

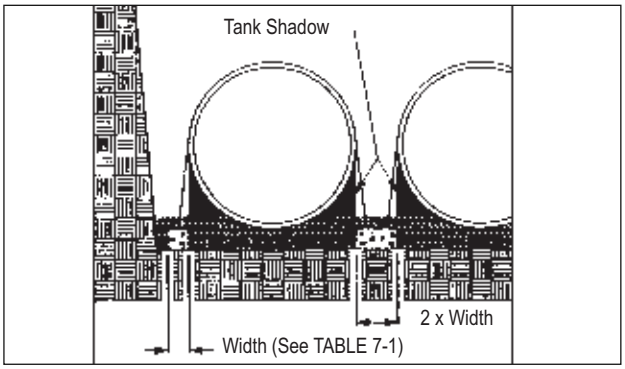
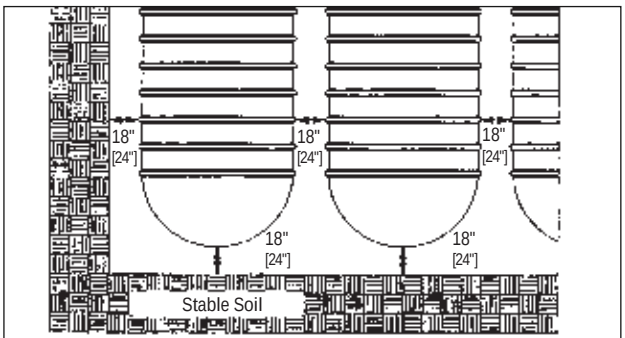


FIGURE 6-3

6.3.2. STABLE IN SITU (NATIVE) SOIL CONDITIONS

6.3.2.1. The minimum spacing between the sidewall or endcap of the tank and the side of the excavation must be 18 inches [24 inches for 12-foot-diameter tanks].

6.3.2.2. If more than one tank is to be installed in the same hole, allow for at least 18 inches between the tanks [24 inches for 12-foot-diameter tanks]. *(See FIGURE 6-4.)*



Note: Number in brackets refers to 12-foot-diameter tanks.

FIGURE 6-4

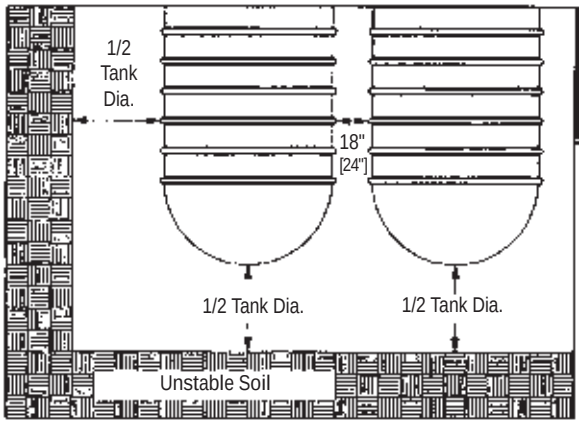
6.3.3. UNSTABLE IN SITU SOIL CONDITIONS

CAUTION

Xerxes recommends that the tank owner seek the advice of a local foundation professional engineer if the in situ soil is extremely soft or inherently unstable (for example, peat, quicksand, muck, landfill, very soft or highly expansive clay, underground stream, etc.).

6.3.3.1. If the soil has less than 750 lbs./sq. ft. cohesion as calculated from an unconfined compression test; or in soils having an ultimate bearing capacity of less than 3,500 lbs./sq. ft.; or where soil will not maintain a vertical wall, the excavation must allow a minimum space equal to half the diameter of the tank between the excavation wall and both the side and the endcap of the tank to enhance lateral resistance. *(See FIGURE 6-5.)*

6.3.3.2. The spacing between adjacent tanks is to be at least 18 inches [24 inches for 12-foot-diameter tanks]. *(See FIGURE 6-5.)*



Note: Number in brackets refers to 12-foot-diameter tanks.

FIGURE 6-5

6.3.3.3. A reinforced concrete slab may be required under the tank as a foundation in the excavation where the bottom is unstable.

6.4. TANK LOCATION — NEARBY STRUCTURES

CAUTION

Xerxes recommends 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). Improper placement may result in tank and/or other property damage.

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

6.4.2. 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 6-6.)*

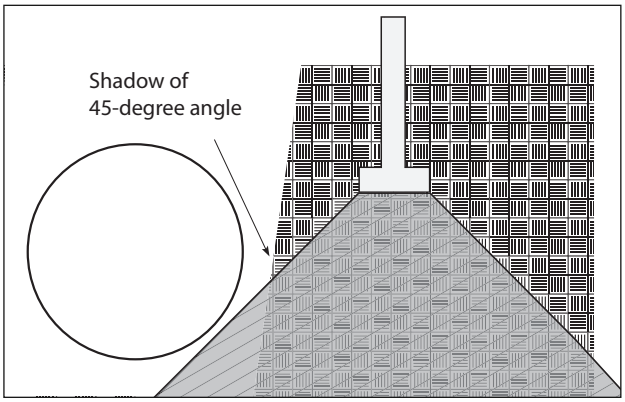


FIGURE 6-6

6.4.2.1. 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.

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

6.4.3.1. Determine the depth of burial needed for the tank.

6.4.3.2. Locate the footing of the structure to be considered.

6.4.3.3. 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.

6.4.3.4. The tank must not fall within the “shadow” of the 45-degree-angle line drawn from the foundation’s footing. *(See FIGURE 6-6.)*

6.4.3.5. 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.

6.5. GEOTEXTILE

6.5.1. 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. Geotextile allows the passage of water but prevents the migration and mixing of in situ soil and the select backfill material. Geotextile helps preserve the integrity of the select backfill envelope, which surrounds and supports the tank.

6.5.2. Xerxes recommends that geotextile be used when the tank is installed in the following:
- areas with frequently changing groundwater conditions or areas subject to tidal fluctuations
- unstable soils such *as cited in SECTION 6.3.3.*
- water conditions with silty in situ soil.

6.5.3. For further information concerning geotextile specifications and installation procedures, consult the geotextile supplier’s installation guidelines or instructions.

6.5.4. Polyethylene film is not considered an effective geotextile material. It may tear or degrade while in service.

7. ANCHORING TANKS

CAUTION

Xerxes recommends that every site be thoroughly evaluated for the potential of a rise in the local water table or of trapped water. Failure to anchor a tank when required may cause tank failure, or damage the tank or surrounding property.

7.1. GENERAL

7.1.1. The tank owner or the owner's technical representative is responsible for determining an appropriate anchoring system.

7.2. DEADMEN

7.2.1. Deadmen are typically reinforced concrete beams.

7.2.2. The length of deadmen is typically equal to the length of the tank.

7.2.3. Deadmen may be fabricated in multiple sections as long as the total length of each deadman is not decreased and as long as each section contains at least two balanced anchor points.

7.2.4. The width and thickness of deadmen depend on the tank diameter, water-table height, number of containment sumps and burial depth.

7.2.5. Deadmen should be designed according to the American Concrete Institute (ACI) code.

7.2.6. *Refer to TABLE 7-1* for typical deadmen dimensions given the situation of an empty tank with a burial depth of 3 feet, with groundwater to grade and with one containment sump.

Tank Diameter	Typical Deadman Dimensions (Width x Depth)
4'	6" x 6"
6'	12" x 12"
8'	12" x 12"
10'	18" x 9"
12'	36" x 8"

TABLE 7-1

7.2.7. Tanks of 10-foot diameter with a capacity of 30,000 gallons or larger may require larger deadmen than those *in TABLE 7-1,* depending on burial depth, to offset buoyancy. Contact technical support at Xerxes Minneapolis for further information.

7.2.8. Lay the deadmen in the excavation parallel to the tank and outside of the tank "shadow." *(See FIGURE 6-3.)*

7.2.9. In multiple tank installations with deadmen:

- each tank will have its own set of deadmen (one deadman may be used between two tanks if the deadman is double in width)
- a separate anchor point must be provided for each hold-down strap
- the minimum spacing between tanks must be no less than twice the width of a single deadman.

7.3. XERXES PREFABRICATED DEADMEN

7.3.1. Xerxes-supplied prefabricated deadmen are pre-engineered and sized to the tank ordered. As with any deadmen, water-table height, number of containment sumps and burial depth must be considered.

7.3.2. Placement of Xerxes prefabricated deadmen is the same as standard deadmen. *(See FIGURE 7-1.)*

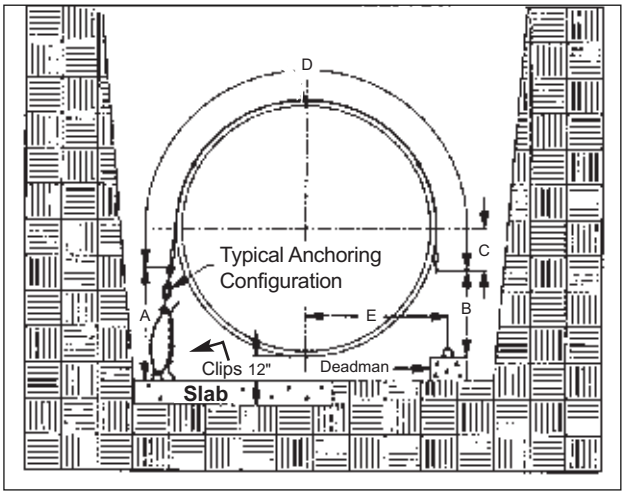


FIGURE 7-1

7.3.3. Xerxes prefabricated deadmen are supplied with 3/4-inch-diameter, galvanized, adjustable anchor points (subsequently referred to as anchor points). These anchor points protrude up through the slots in the deadmen and are held up with temporary supports.

⚠ WARNING

Only use the anchor points when lifting and positioning the deadmen. A spreader bar may be required to lift longer sections of deadmen. Use guy ropes to guide the deadmen when lifting. Failure to do so could result in death or serious injury.

7.3.4. The anchor points can be moved and positioned to match the hold-down strap locations on the tank (marked by arrowhead symbols ▶◀).

7.3.5. When using these deadmen in man-out-of-hole strapping applications, align the anchor points with the proper ribs before setting them in the hole.

7.3.6. Care should be taken to keep backfill from entering the anchor-point slot until final adjustment is made.

7.3.7. The deadmen are to be butted together when multiple sections are used.

7.3.8. Use one anchor point per strap end and only one strap per anchor point.

7.4. ANCHOR SLABS

7.4.1. An anchor slab is a reinforced concrete base and should be designed according to the ACI code.

7.4.2. The total length of the slab must be at least the same as the length of the tank.

7.4.3. The minimum slab thickness is 8 inches.

7.4.4. The width of the slab depends on the tank diameter. The slab must extend a minimum of 18 inches [12 inches for 4-foot-diameter tanks] beyond each side of the tank.

7.4.5. *Refer to FIGURE 7-1* and *to TABLE 7-2* for anchor-point dimensions.

Tank Diameter	Anchoring Dimensions					
	"A"	"B"	"C"	"D"	"E" Min.	"E" Max.
4'	24"	18"	12"	8' - 4 1/4"	27"	30"
6'	35"	23"	13"	12' - 1"	42"	48"
8'	43"	31"	15"	15' - 1"	52"	58"
10'	57"	45"	15"	18' - 8 3/4"	69"	75"
12'	58"	50"	23"	22' - 6 3/4"	87"	93"

TABLE 7-2

7.4.6. Provide a separate anchor point for each hold-down strap.

7.4.7. All anchor points must be engineered to withstand the tank's buoyancy forces.

7.4.8. When using a concrete anchor slab, allow sufficient depth in the excavation for 12 inches of bedding material between the tank and the anchor slab. *(See FIGURE 7-1.)*

7.5. HOLD-DOWN STRAPS

7.5.1. Only Xerxes straps may be used when anchoring a Xerxes tank.

7.5.2. The locations for hold-down straps on each tank are marked on the tank by the arrowhead symbols ▶◀.

7.5.3. Straps must be used on all marked hold-down locations.

CAUTION

Do not place straps between ribs (except on 4-foot-diameter tanks). Failure to properly place straps may result in tank damage.

7.5.4. Data for hold-down straps are given *in TABLE 7-2 and FIGURE 7-1.*

7.5.5. Evenly distribute loads by tightening all hold-down straps uniformly until they are snug over the ribs but cause no deflection of the tank.

7.5.6. Take a measurement of the internal diameter of the tank to determine whether vertical deflection is within the limits specified by Xerxes after the straps have been installed and tightened. (*See SECTION 16 of the Installation Manual for instructions on taking diameter measurements.*)

7.6. HARDWARE AND ANCHORING POINTS

7.6.1. Anchoring hardware must be sized *according to TABLE 7-3,* and manufactured to industry standards and dimensions.

Tank Diameter	Minimum Turnbuckle Diameter (by Type)			Minimum Wire-Rope Diameter
	Hook	Jaw	Eye	
4'	3/4"	1/2"	1/2"	3/8"
6'	3/4"	1/2"	1/2"	3/8"
8'	1 1/4"	3/4"	3/4"	1/2"
10'	1 1/4"	3/4"	3/4"	1/2"
12'	1 1/4"	3/4"	3/4"	1/2"

TABLE 7-3

7.6.2. The installing contractor is responsible for providing hardware and anchor points of sufficient size and strength.

7.6.3. The particular configuration of hardware will be determined by the contractor, the owner or the owner's representative.

7.6.4. Locate the anchor points *as shown in TABLE 7-2 and FIGURE 7-1.* Refer to dimension "E." Align (within a tolerance of ±1 inch) all anchor points with the marked arrowhead symbols ▶◀ on the tanks.

7.6.5. For specific information on hardware and its use, consult the hardware manufacturer or supplier.

7.6.6. The installer is responsible for using appropriate and approved engineering practices when fastening wire rope. Refer to recommendations of wire-rope manufacturer and supplier, and follow accepted industry standards when selecting, using, attaching or connecting wire rope. *(See FIGURE 7-3, FIGURE 7-4 and FIGURE 7-5.)*

⚠ CAUTION

Use only appropriately sized hardware with the strap eye. Oversized hardware may damage the strap eye and result in minor or moderate injury. *See FIGURE 7-2* for dimensions of strap eye.

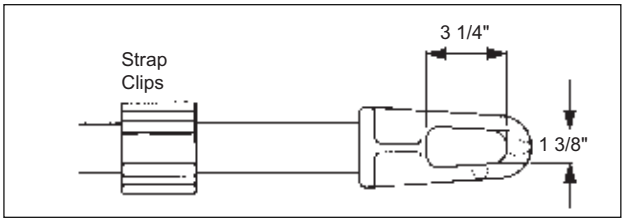


FIGURE 7-2

7.6.7. When connecting the end of a hold-down strap to the anchor, common methods *(shown in FIGURE 7-3)* are using a drop-forged turnbuckle (*see A)*, using a looped wire rope (*see B)*, or using a combination of both (*see C)*.

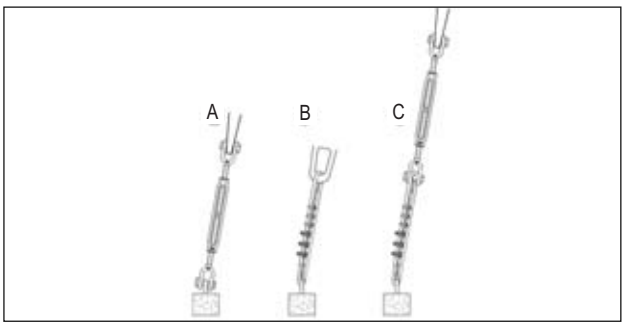


FIGURE 7-3

7.6.8. All exposed metal on the anchoring system must be coated or galvanized to protect against corrosion.

7.6.9. When fastening wire rope, use a minimum of two clips for a 3/8-inch wire rope and three clips for a 1/2-inch wire rope on each termination. *See TABLE 7-3* for minimum wire-rope diameter.

7.6.10. Turn back from the thimble the exact amount of wire rope specified by the manufacturer of the clips used.

7.6.11. Apply the first clip at a distance from the dead end of the wire rope that is equal to the largest width of the clip used. *(See FIGURE 7-4.)*

7.6.12. For each clip, apply a U-bolt over the dead end of the wire rope. *(See FIGURE 7-4.)* **(Note: Live end rests in saddle.)**

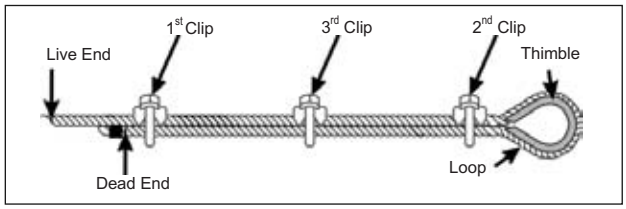


FIGURE 7-4

7.6.13. When two clips are required, apply the second clip as close to the loop or thimble as possible. *(See FIGURE 7-4.)*

7.6.14. When more than two clips are required, apply the second clip as close to the loop or thimble as possible, turn nuts on second clip firmly, but do not tighten initially. *(See FIGURE 7-4.)*

7.6.15. When more than two clips are required, space additional clips equally between the first two, take up rope slack and tighten nuts on each U-bolt evenly.

7.6.16. Tighten all hardware uniformly and follow the manufacturer's torque specifications. Double-check the tightness once the anchoring system is complete.

7.6.17. If forming a loop in the wire rope, a splice is required for connecting the two ends together. Standard rigging practice for splicing wire rope calls for using twice the number of clips recommended for a single-end termination. Use a minimum of four clips for a 3/8-inch wire rope and a minimum of six clips for a 1/2-inch wire rope. Place the rope ends parallel to each other and install the clips *as shown in FIGURE 7-5.*

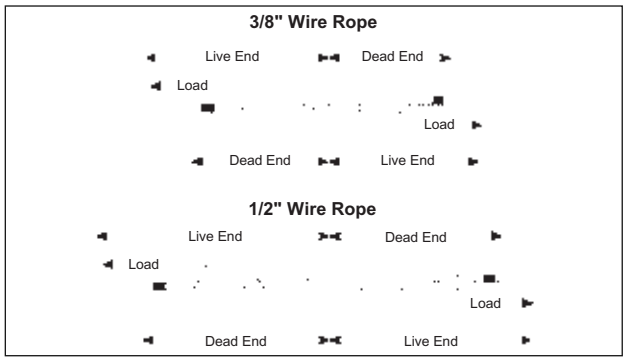


FIGURE 7-5

7.7. MAN-OUT-OF-HOLE (MOH) ANCHORING

7.7.1. The Xerxes man-out-of-hole (MOH) strapping system is designed for use in installations where water is in the excavation and/or where personnel may not enter the hole because of site restraints. An MOH strapping system can be, but need not be, used in conjunction with Xerxes deadmen.

7.7.2. When using the MOH strapping system, the placement of components is critical. See separate Xerxes document, Man-Out-of-Hole (MOH) Straps Instructions.

7.8. ALTERNATE ANCHORING METHODS IN WET-HOLE INSTALLATIONS

7.8.1. In wet-hole installations, when Xerxes' preferred method of man-out-of-hole anchoring is not available, the following methods may be used:

7.8.1.1. With both methods, place the hold-down strap between the wire rope and the tank so that the wire rope is never in direct contact with the tank.

7.8.1.2. The H-shaped positioning clips around the strap are designed to accommodate the wire rope on top of the strap *as shown in FIGURE 7-6 and FIGURE 7-7.*

7.8.1.3. The following method *is shown in FIGURE 7-6*:

- attach a wire rope to each end of each hold-down strap
- secure the termination of the wire rope
- center each hold-down strap on each rib marked with the arrowhead symbols ▶◀
- place deadmen on top of the wire ropes on each side of the tank
- lower the deadmen to the bottom of the excavation
- take the slack out of each wire rope and splice the termination of the wire ropes on top of the tank.

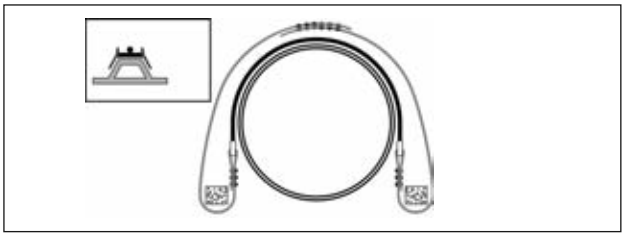


FIGURE 7-6

7.8.1.4. The following method *is shown in FIGURE 7-7:*

- loop a wire rope around the deadman at each location that corresponds to each rib marked with the arrowhead symbols ▶◀
- secure the termination of the wire rope
- lower each deadman to the bottom of the excavation using the wire rope
- center each hold-down strap on each rib marked with the arrowhead symbols ▶◀
- bring the live end of each wire rope up to the top of the tank at each marked rib
- take the slack out of each wire rope and splice the termination of the wire ropes on top of the tank.

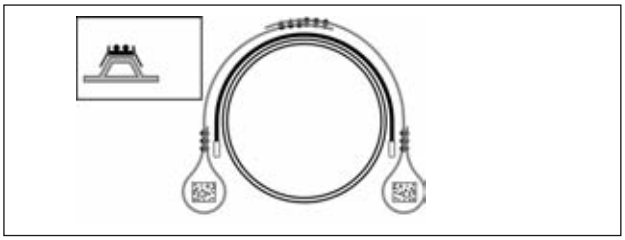


FIGURE 7-7

8. BOTTOM SUMPS AND FITTINGS

8.1. GENERAL

8.1.1. When handling a tank with a bottom sump or fitting, always take extra care so that the bottom sump or fitting is not damaged by contact with any other object, such as the truck bed or the ground.

8.1.2. When installing a large bottom sump in a water or wastewater tank, see Xerxes document, Large Bottom Sump Installation Instructions. *(See Point 22.1.1.1.)*

CAUTION

All connections to the tank must be flexible. Provisions must be made to accommodate movement and misalignment between the piping and the tank. Failure to do this may damage the tank or surrounding property.

8.1.3. During installation, provide a clear area in the backfill bedding so that the tank rests on the backfill bedding and the sump or bottom fitting is clear.

8.1.4. After setting the tank, fill and tamp the resulting void by using hand tools before continuing the backfilling.

9. INSTALLATION

⚠ WARNING

If product is used as ballast, exercise special care in handling. Safeguard against sparks, fire or product spills. Improper handling of product could cause a fire or explosion and result in death or serious injury.

⚠ WARNING

Do not use air pressure to test tanks that contain or have contained flammable or combustible liquids or vapors. The fuel and air mixture could explode and result in death or serious injury. Tanks should be air tested before ballasting.

CAUTION

Adequately ballast the tank (add liquid) in a wet hole or in a dry hole that may become wet (for example, from site runoff) until the installation is totally completed. Failure to do this may damage the tank or surrounding property.

9.1. GENERAL

9.1.1. Use only approved backfill material. *(See SECTION 5.)*

9.1.2. Do not mix approved material with sand or in situ soil.

9.1.3. Do not use in situ soil as backfill material.

9.1.4. All excavated in situ soil must be replaced with approved material.

9.2. DRY-HOLE INSTALLATION

9.2.1. Prepare a smooth, level bed, 12 inches thick, of approved backfill material.

9.2.2. *Refer to Points 2.1.3. through 2.1.3.6.* regarding the use of lifting lugs to hoist the tank when unloading and installing it.

9.2.3. Place the tank or tanks onto the bed. Do not set Xerxes tanks directly onto a concrete slab, on timbers or cradles, or onto the in situ soil.

9.2.4. As the tank is being placed, slope the tank according to site specifications. (Xerxes does not require that a tank be sloped. The slope is determined by the tank owner's specifications.)

9.2.5. Sloping of tanks may affect accuracy of Xerxes calibration charts.

9.2.6. If a double-wall tank is sloped, the monitor should be at the low end.

9.2.7. Use the tops of the ribs to establish longitudinal level. Establish lateral level by placing the level across the top of a fitting or a manway.

9.2.8. When the tank is placed, take a measurement of the internal diameter of the tank. *(See SECTION 16 of the Installation Manual* for instructions on taking diameter measurements.) Record this measurement as Initial Internal Diameter on the Tank Installation Checklist, SECTION 4.

9.2.9. If the tank is to be anchored, install the anchoring hardware at this time. *(See SECTION 7.)*

9.2.10. Place one 12-inch lift of approved backfill material evenly around the tank. From the edge of the hole or the top of an adjacent tank, push the backfill in place by using a nonmetal probe long enough to reach beneath the tank. Work the backfill material under the tank body and domes so the tank is fully supported – that is, so there are no voids under the tank. *(See FIGURE 9-1 and FIGURE 9-2.)*

CAUTION

Do not strike the tank with the probe or tank damage may result.

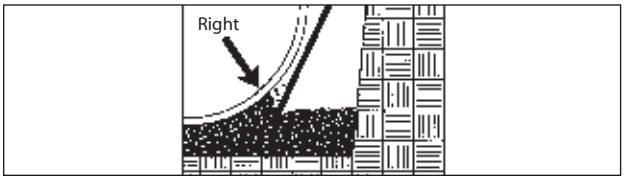


FIGURE 9-1

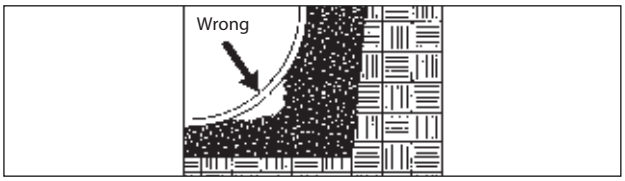


FIGURE 9-2

9.2.11. Repeat Point 9.2.10. with a second 12-inch lift.

9.2.12. After the second lift of material has been placed and worked under the tank, bring the backfill to the top of the tank.

9.3. WET-HOLE INSTALLATION

9.3.1. Follow the dry-hole installation procedure *(SECTION 9.2.)* with the following modifications:

9.3.1.1. Before performing Point 9.2.1. of the dry-hole installation, take a measurement of the internal diameter of the tank before the tank is placed in the excavation hole. *(See SECTION 16 of the Installation Manual for instructions on taking diameter measurements.*) Record this measurement as Initial Internal Diameter on the Tank Installation Checklist, SECTION 4.

9.3.1.2. Before performing Point 9.2.1. of the dry-hole installation,

pump the water from the hole and continue pumping to maintain minimum water level during tank installation.

9.3.1.3. During Point 9.2.3. of the dry-hole installation, when setting and leveling the tank, partially ballast the tank until it settles firmly on the prepared bed. The ballast level in the tank must never exceed the water level in the hole by more than 1 foot until the backfill reaches the top of the tank. *(See FIGURE 9-3.)*

9.3.1.4. Omit Point 9.2.8.

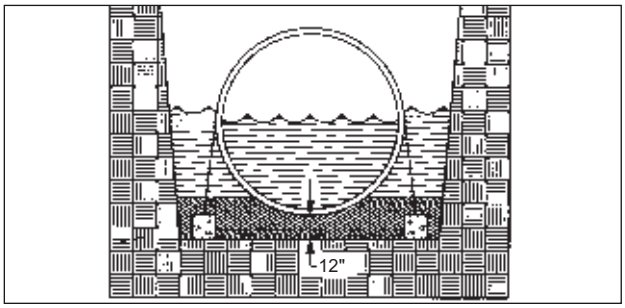


FIGURE 9-3

9.3.2. Cover depth must meet minimum depth *specified in SECTION 6 of this Installation Manual.*

9.3.3. Completely ballast the tank once backfill is even with the top of the tank.

10. POSTINSTALLATION TESTING FOR AIR-TESTABLE TANKS

⚠ WARNING

Do not use air pressure to test tanks that contain or have contained flammable or combustible liquids or vapors. The fuel and air mixture could explode and result in death or serious injury. Tanks should be air tested before ballasting.

10.1. GENERAL

10.1.1. For air-testable tanks, follow the procedures for the appropriate type of tank as outlined *in SECTION 4*. **For tanks that are not air-testable, proceed to SECTION 11.**

10.1.2. Do not use atmospheric air when testing air-testable tanks. Use nitrogen or other inert gas when testing tanks that have been ballasted with product.

⚠ WARNING

If product is used as ballast, exercise special care in handling. Safeguard against sparks, fire or product spills. Improper handling of product could cause a fire or explosion and result in death or serious injury.

10.1.3. After backfill is brought to the top of the tank, take a measurement of the internal diameter of the tank as a deflection check. *(See SECTION 16 of the Installation Manual* for instructions on taking diameter measurements.)

10.1.4. After the internal diameter of the tank has been measured and vertical deflection is determined to be within the limits specified by Xerxes *(See table in Tank Installation Checklist, SECTION 4.),* the tank must be pressure-tested to ensure that no damage occurred during installation.

11. OPTIONAL HYDROSTATIC TESTING

11.1. GENERAL

11.1.1. These instructions are for an optional hydrostatic test after backfilling is completed to the top of the tanks.

CAUTION

If the tank is to be hydrostatically tested, it must be supported by backfill on all sides to the top of the tank. Failure to do so may result in property damage.

11.1.2. Verify that the vertical deflection is within tolerances listed in the table on the Tank Installation Checklist, SECTION 4.

11.1.3. Seal off influent and effluent piping with watertight caps or plugs.

11.1.4. Fill the tank with water to a level that is 3 inches into the access openings after the hole is backfilled at least 3/4 of the way up the tank.

11.1.5. Let the water stand in the tank for a minimum of 1 hour (or longer if required by applicable local codes).

11.1.6. If the water level drops, check to see that plugs or caps sealing off piping are tight and then add more water to fill air voids back to the standard testing level. *(See Point 11.1.4.)*

11.1.7. If the water level does not stabilize, there may be a leak in the system. If damage is detected, do not attempt repairs. Contact the UST coordinator at the Xerxes plant nearest you. Telephone and fax numbers are found on the back cover of this manual.

12. BALLASTING (ADDING LIQUID)

⚠ WARNING

Do not use air pressure to test tanks that contain or have contained flammable or combustible liquids or vapors, and do not perform any postinstallation pressure tests. The fuel and air mixture could explode and result in death or serious injury. Tanks should be air tested before ballasting.

⚠ WARNING

If product is used as ballast, exercise special care in handling. Safeguard against sparks, fire or product spills. Improper handling of product could cause a fire or explosion and result in death or serious injury.

⚠ WARNING

The tank shall be adequately vented to prevent the development of vacuum or pressure when filling or emptying the tank. Failure to properly vent the tank could cause tank failure and result in death or serious injury.

12.1. GENERAL

12.1.1. In most anchoring systems, a tank is not adequately protected against flotation until the tank is fully backfilled and the top slab is in place. Therefore, during the installation process, the tank should be ballasted completely after the backfill is even with the top of the tank and after postinstallation testing has been successfully completed.

12.1.2. Only under wet-hole conditions should ballast be added before the backfill is even with the top of the tank. *(See SECTION 8.)*

13. PIPING AND VENTING

13.1. INTERNAL PIPING

13.1.1. All piping must conform to all applicable codes and standards. *(See SECTION 1.)*

CAUTION

All internal piping must be at least 4 inches [6 inches for 12-foot-diameter tanks] from the tank bottom. Failure to do this may damage the tank or surrounding property.

CAUTION

All metal fittings and other metal components must be coated to protect against corrosion. Failure to do this may result in damage to these parts or to surrounding property.

13.1.2. For petroleum tanks, *refer to FIGURE 13-1 along with TABLE 13-1* to determine the correct dimensions for sizing internal piping.

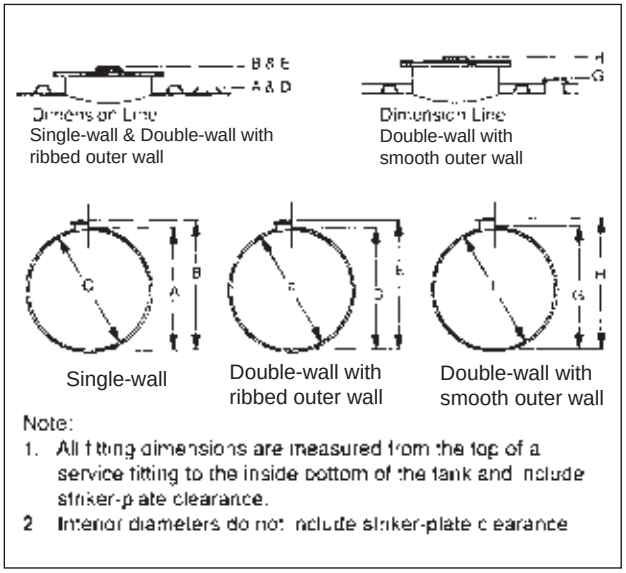


FIGURE 13-1

Interior Dimensions in FIGURE 13-1	Tank Diameter				
	4'	6'	8'	10'	12'
"A"	49 1/4"	73"	92"	121"	138 1/4"
"B"	54 1/2"	78"	98"	126"	143 1/4"
"C"	48"	71 3/8"	91 3/16"	119 3/16"	136 5/8"
"D"	49 1/2"	72 3/4"	91 1/2"	120"	———
"E"	55"	77 3/4"	97 1/4"	125 3/4"	———
"F"	48"	70 5/8"	90 5/8"	118 1/2"	———
"G"	51 1/2"	75 1/8"	95 3/8"	123 1/2"	———
"H"	56 5/8"	80 1/4"	100 1/2"	128 5/8"	———
"I"	48"	71 3/8"	91 3/16"	119 3/16"	———

TABLE 13-1

13.1.3. For wastewater tanks, *refer to FIGURE 13-2 along with TABLE 13-2* to correctly size internal piping.

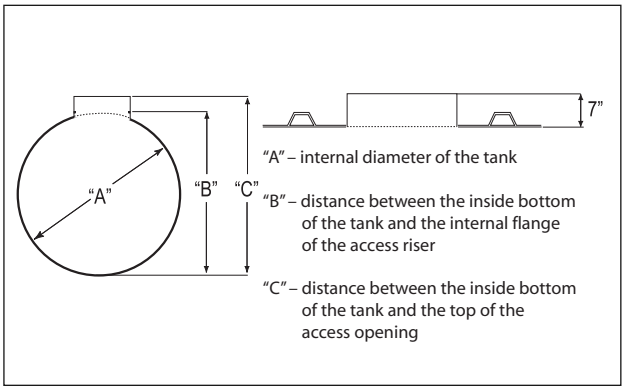


FIGURE 13-2

Interior Dimensions in FIGURE 13-1	Tank Diameter				
	4'	6'	8'	10'	12'
"A"	48"	71-3/8"	91"	119-1/4"	138-1/2"
"B"	51-3/8"	74-3/4"	94-3/8"	122-5/8"	142"
"C"	55-3/8"	78-3/4"	98-3/8"	126-5/8"	146"

TABLE 13-2

13.2. EXTERNAL PIPING

⚠ WARNING

When pressure-testing the external piping, the tank must be isolated from all piping. The test pressures for external piping could cause tank failure and result in death or serious injury.

CAUTION

When extending monitoring or vapor-recovery piping to the surface, make sure the at-grade fittings are different from any fill fittings and will not accept standard fill hoses. Failure to do this may damage the tank or surrounding property.

CAUTION

All connections to the tank must be flexible. Provisions must be made to accommodate movement and misalignment between the piping and the tank. Failure to do this may damage the tank or surrounding property.

13.3. VENTING TANKS

⚠ WARNING

All underground tanks/compartments shall be adequately vented to prevent the development of vacuum or pressure when filling or emptying the tank. Failure to properly vent a tank or compartment could cause tank failure and result in death or serious injury.

13.3.1. The single-wall tank is designed to operate at atmospheric pressure.

13.3.2. In the double-wall and triple-wall tank, the primary tank is designed to operate at atmospheric pressure.

13.3.3. The tank's venting system must be adequately sized to ensure that atmospheric pressure is maintained at all times, including during filling and emptying of tank.

13.3.4. Whenever installing overfill protection, such as alarms, automatic shut-off devices ("flapper valves") or vent-restriction devices ("ball-float valves"), follow the instructions provided by the manufacturer of the overfill-protection device and consult the authority having jurisdiction to determine the level at which the overfill protection should operate.

⚠ WARNING

Overfill protection, such as automatic shut-off devices or vent-restriction devices, should not be installed if owner/operator will allow pump- or pressure-filling of tank. Failure to follow this warning could cause tank failure and result in death or serious injury.

13.4. VENTING INTERSTITIAL SPACES

CAUTION

All reservoirs must be vented for proper operation. Failure to do this may damage the tank or surrounding property.

13.4.1. When the tank's interstitial space is filled with a monitoring fluid, the space must be vented. It is sufficient to drill a 1/4-inch-diameter hole in the side or cap of the reservoir standpipe as supplied by the installer. If the groundwater level could be high enough to enter a drilled vent hole, install a vent line from the standpipe to above high-water level.

13.4.2. When the interstitial space is dry, it is not necessary to vent the space to atmosphere.

14 FILLING PETROLEUM TANKS

14.1. GENERAL

14.1.1. Xerxes recommends only gravity-filling of petroleum tanks.

14.1.2. *See SECTION 20, Operating Guidelines.*

15. BACKFILLING TO GRADE

15.1. GENERAL

15.1.1. Continue to take safety measures (such as placing barricades) around the excavation site until installation is completed.

15.1.2. When the tank has been set, tested and backfilled, and all piping and venting has been completed, add the balance of the backfill material.

15.1.3. The backfill must be free of debris, ice or snow. Any blocks or bricks used as support material during piping must be removed prior to completion of backfilling.

15.1.4. The backfill material *specified in SECTION 5* must be used to completely fill excavation.

15.1.5. Be sure that the installation meets all of the requirements of minimum cover *as specified in SECTION 6.*

15.1.6. When the tank has been backfilled to subgrade (before placement of asphalt or concrete), take a measurement of the internal diameter of the tank. (*See SECTION 16* of the Installation Manual for instructions on taking diameter measurements.) Record this measurement as Final Internal Diameter on the Tank Installation Checklist, Section 4.

15.1.7. Complete the Tank Installation Checklist.

16. DEFLECTION MEASUREMENT

16.1. GENERAL

16.1.1. Obtain the deflection measurement by taking a minimum of two measurements of the internal diameter of the tank.

16.1.2. Two methods of measuring the internal diameter of the tank are described here. Both methods use a dipstick. (Similar methods can be used, such as using a tape measure, etc.)

16.1.3. The deflection measurement can be obtained by using either method twice or by using each method once. Each will be described here as if that method were being used twice.

16.1.4. Take the initial internal-diameter measurement before backfilling the tank. *(See Point 9.2.8.)* In a wet-hole installation, take this measurement before the tank is placed in the excavation hole. *(See Point 9.3.1.1.)*

16.1.5. Take other diameter measurements during the backfilling process to determine whether vertical deflection continues to be within the limits specified by Xerxes. *(See Point 7.5.6. and Point 10.1.3.)*

16.1.6. Take the final internal-diameter measurement when the tank has been backfilled to subgrade. *(See Point 15.1.6.)*

16.1.7. For both methods, drive a small-headed, nonsparking nail (for example, brass) halfway into a wooden dipstick 1 inch above its base.

16.2. INTERNAL-DIAMETER MEASUREMENT WITHOUT A STANDPIPE

16.2.1. Place the dipstick into a service fitting.

16.2.2. Measure and record the distance from the tank bottom to the top of the fitting.

16.2.3. Pull the dipstick up until the exposed nail catches on the inside top of the tank.

16.2.4. Measure the distance from the tank top (inside) to the top of the fitting. Subtract 1 inch from this measurement and record the distance.

16.2.5. Subtract the second distance (inside tank top to top of fitting) from the first distance (tank bottom to top of fitting). Record this measurement as Initial Internal Diameter on the Tank Installation Checklist, SECTION 4.

16.2.6. For subsequent measurements of the internal diameter, repeat Points 16.2.1. through 16.2.5. When the measurement is the final diameter measurement, record this measurement as Final Internal Diameter on the Tank Installation Checklist, SECTION 4.

16.3. INTERNAL-DIAMETER MEASUREMENT WITH A STANDPIPE

16.3.1. Place the dipstick into a service fitting with a standpipe.

16.3.2. Measure and record the distance from the tank bottom to the top of the standpipe.

16.3.3. Pull the dipstick up until the nail catches on the inside top of the tank.

16.3.4. Measure the distance from the tank top (inside) to the top of the standpipe. Subtract 1 inch from this measurement and record the distance.

16.3.5. Subtract the second distance (inside tank top to top of standpipe) from the first distance (tank bottom to top of standpipe). Record this measurement as Initial Internal Diameter on the Tank Installation Checklist, SECTION 4.

16.3.6. For subsequent measurements of the internal diameter, repeat Points 16.3.1. through 16.3.5. When the measurement is the final diameter measurement, record this measurement as Final Internal Diameter on the Tank Installation Checklist, SECTION 4.

16.4. CALCULATION AND COMPARISON

16.4.1. To get the deflection measurement at any time, subtract the current internal-diameter measurement from the initial internal-diameter measurement.

16.4.2. Compare this measurement to the allowable deflections *shown in the table on the Tank Installation Checklist, SECTION 4.*

16.4.3. Vertical deflection in excess of this measurement indicates improper installation and voids the tank warranty.

Note: When installing single-wall wastewater tanks, proceed to SECTION 19.

17. MONITORING TANKS

17.1. SINGLE-WALL TANK

17.1.1. Single-wall tank installations may require release detection monitoring, which can include inventory control, automatic tank gauging, vapor monitoring or groundwater monitoring.

17.1.2. Check with federal, state and local officials for requirements in your area.

17.2. DOUBLE-WALL TANK

17.2.1. A Xerxes double-wall tank has an interstitial space between the wall of the primary (internal) tank and the wall of the secondary (external) tank for the containment and detection of leaked product from the primary tank.

17.2.2. The tank, as supplied, will have a minimum of one monitor fitting that provides access into the interstitial space.

17.3. DOUBLE-WALL TANK WITH DRY INTERSTITIAL SPACE

17.3.1. The monitoring system and method is the responsibility of the tank owner and/or operator.

17.3.2. A safe electronic or mechanical system should be used to detect either product or incoming water.

17.3.3. The monitoring system should detect leakage near the bottom of the tank.

17.3.4. Monitoring can be done through the monitor fitting provided.

17.3.5. If a double-wall tank is sloped, the monitor should be at the low end.

17.4. DOUBLE-WALL TANK WITH WET INTERSTITIAL SPACE

17.4.1. GENERAL

17.4.1.1. With a wet interstitial monitoring system (TRUCHEK®), the interstitial space is typically filled with monitoring fluid at the manufacturing facility.

CAUTION

All wet interstitial spaces must be vented to atmosphere. *(See SECTION 13.4.)*

17.4.1.2. When the tank is delivered, check the monitoring-fluid level and record it on the shipping/receiving paperwork and Tank Installation Checklist. *(See FIGURE 17-1.)*

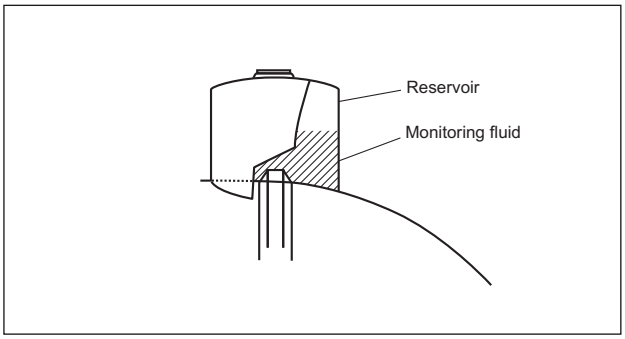


FIGURE 17-1

17.4.1.3. If monitoring fluid is not in the reservoir, call the UST coordinator at the Xerxes plant nearest you.

17.4.1.4. The TRUCHEK system enables the owner to have continuous monitoring or to conduct a tank-tightness test. TRUCHEK meets the EPA criteria for tank-tightness testing. *(See the Xerxes TRUCHEK brochure.)*

17.4.1.5. In a tank with the interstice filled with monitoring fluid, Xerxes recommends using a nonmetalic standpipe in the reservoir.

CAUTION

Monitoring fluid should not be present in the standpipe except during a TRUCHEK test. *(See the Xerxes TRUCHEK brochure.)* Monitoring fluid in the standpipe may create excessive pressure on the interstitial space and may result in tank damage.

17.4.1.6. The monitoring-fluid level may fluctuate during shipping and installation. Do not add monitoring fluid until after tank burial is completed and the monitoring system is set up.

17.4.1.7. During the installation process, the monitoring-fluid level in the reservoir will rise naturally under various conditions:

- preinstallation air test
- rise in groundwater level
- backfill compaction
- ballasting.

17.4.1.8. If a tank is sloped, the reservoir should be at the high end.

17.4.1.9. Check and record the monitoring-fluid level during the installation process. *(See Tank Installation Checklist.)*

17.4.2. SETTING THE LEVEL OF THE MONITORING FLUID

17.4.2.1. After backfilling and top-slab placement is completed, check the level of the monitoring fluid in the reservoir and set the monitoring fluid to the proper level.

CAUTION

Failure to set the monitoring-fluid level properly may lead to false alarms.

17.4.2.2. Once the tank is installed, the level of the monitoring fluid may fluctuate due to such things as:
- product level
- groundwater fluctuation
- tank filling and emptying
- product-temperature variation.

17.4.2.3. To establish the proper operating level for monitoring fluid, decide what type of monitoring probe will be used in order to determine the initial starting point for the level in the reservoir.

17.4.2.3.1. The typical probe has two sensors (a high-fluid level and a low-fluid level). When using a two-sensor probe, the start point (the proper level for the monitoring fluid) is midway between the two sensors.

17.4.2.3.2. If using something other than a two-sensor probe, use 7 inches from the top of the tank as the start point for the monitoring-fluid level.

Note: When using a probe, do not raise it off the tank to meet the monitoring-fluid level. The probe must remain upright and in contact with the top of the tank at all times. ***(See FIGURE 17-2.)***

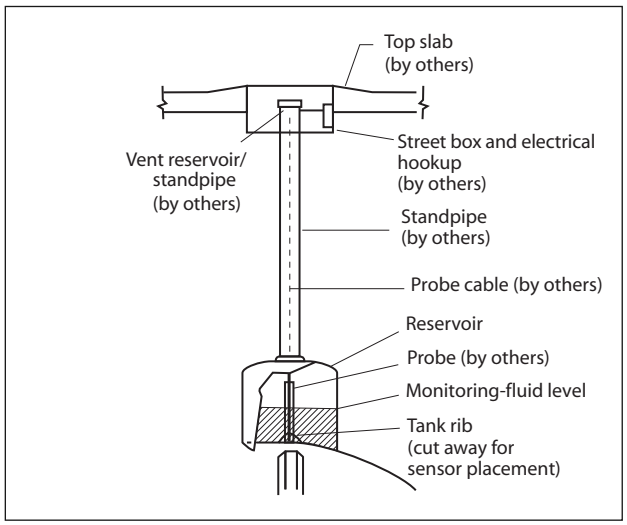


FIGURE 17-2

17.4.2.4. After determining the start point, adjust the monitoring fluid based on the product level:

17.4.2.4.1. If the tank is between 1/4 and 1/2 full of product, the proper operating level for the monitoring fluid is **at** the start point.

17.4.2.4.2. If the tank is between empty and 1/4 full, the proper operating level for the monitoring fluid is about 1 - 1 1/2 inches **below** the start point.

17.4.2.4.3. If the tank is between 1/2 full and full, the proper operating level for the monitoring fluid is about 1 - 1 1/2 inches **above** the start point.

17.4.2.5. Add or remove monitoring fluid to reach the proper operating level for the monitoring fluid.

17.4.3. TRUCHEK®

17.4.3.1. If a TRUCHEK test is required after installation, follow the procedures in the Xerxes TRUCHEK brochure.

17.4.3.2. After this test, reset the monitoring-fluid level to a position based on the product level.

18. INSTALLING CONTAINMENT SUMPS

18.1. GENERAL

18.1.1. Xerxes containment sumps come in a variety of models and sizes, including single-wall and double-wall models, and round and flat-sided models. Instructions for the different models are found in Xerxes' supplemental materials. *See SECTION 22 of this Installation Manual* for information on supplemental instructions.

18.1.2. The containment sump may be a termination point for secondary piping systems. It is designed to be monitored continuously for leaks using electronic sensors. Consult federal, state and local codes and regulations to ensure proper monitoring compliance.

18.1.3. All Xerxes containment sumps must be isolated from traffic loads.

18.2 FINAL CONTAINMENT SUMP INSTALLATION

CAUTION

Make sure that no heavy objects are allowed to distort the containment sump top after final assembly. This includes the street box and concrete pad. No weight should be transferred to the tank. Failure to do so may result in property damage.

18.2.1. Backfill to the top of the containment sump system.

18.2.2. Backfill around the outside edge of the containment sump, making sure that no backfill is on top of the containment sump. *(See FIGURE 18-1, Area A.)*

18.2.3. Isolate the containment sump from all traffic loads.

18.2.3.1. The contractor must install a concrete form/barrier to allow a minimum 3-inch clearance between any load-bearing item (for example, the concrete pad/street-box frame) and the containment sump top.

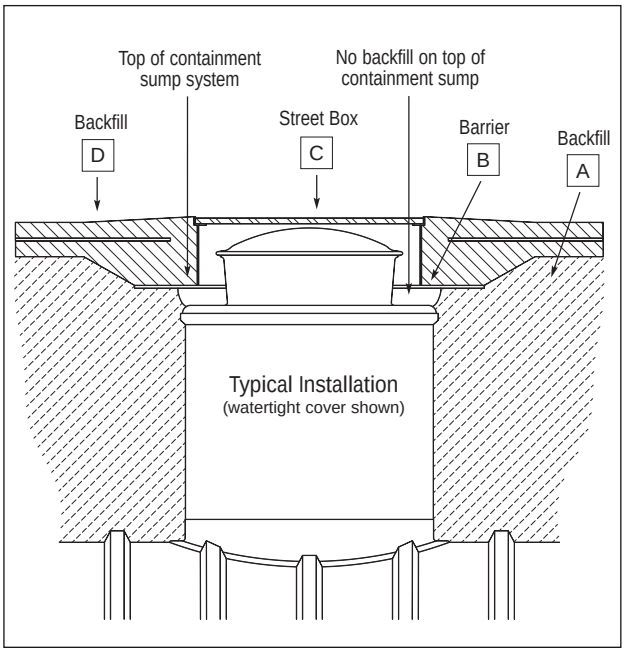


FIGURE 18-1

18.2.3.2. Typically, a sheet of plywood (or other material) is used as a barrier and is set on the pea gravel to ensure that there is at least a 3-inch clearance above the containment sump top. (*See FIGURE 18-1, Area B.*)

18.2.4. Choose a street-box size that allows enough clearance around the containment sump top opening for proper operation of the cover.

18.2.5. Set the street box, and check for clearance to allow access and space to remove the watertight cover. (*See FIGURE 18-1, Area C.*)

18.2.6. Continue with backfill, as required, to subgrade. (*See FIGURE 18-1, Area D.*)

18.2.7. Maintain good drainage of water away from the access opening of the containment sump top.

19. ADDING TANKS AT EXISTING LOCATIONS

19.1. GENERAL

19.1.1. Additional Xerxes tanks may be installed at existing locations if proper foundation support exists.

19.1.2. It is the responsibility of the tank owner to choose the correct method of installation.

19.1.3. Xerxes requires that one of the following methods be used.

19.2. PREFERRED METHOD

19.2.1. The preferred method *(FIGURE 19-1)* is the following:

- install a new tank in a separate hole at least 3 feet from the original hole
- follow procedures outlined in this Installation Manual
- exercise caution in keeping unusual surface loads off existing tanks
- maintain the natural barrier of undisturbed soil between tanks.

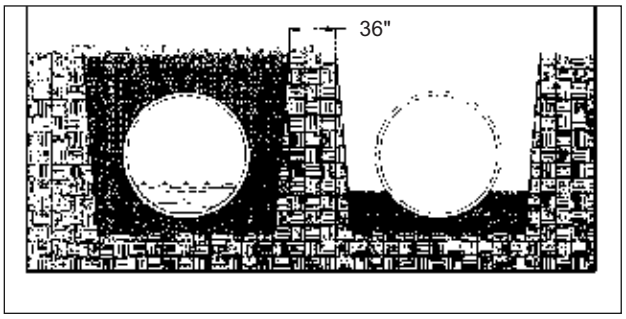


FIGURE 19-1

19.3. ALTERNATE METHOD

19.3.1. If the preferred method outlined above is not practical, an alternate method *(FIGURE 19-2)* is the following:

- bury additional tanks in the same installation hole
- empty existing tanks to less than 1/4 capacity
- remove the surface slab
- enlarge the excavation for the new tanks, leaving as much backfill as possible around existing tanks
- install shoring, if necessary, to make sure that existing tanks do not move and sufficient backfill remains
- follow procedures and requirements outlined in this Installation Manual
- *see SECTION 6 for excavation parameters.*

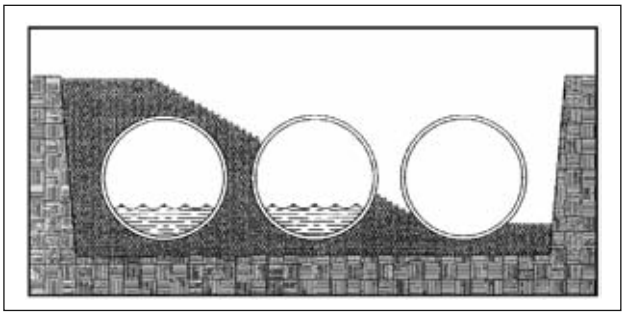


FIGURE 19-2

20. OPERATING GUIDELINES

20.1. GENERAL

20.1.1. Owner must retain the Installation Manual and Operating Guidelines for future reference to operating guidelines.

20.1.2. In addition to these installation instructions and operating guidelines, follow all federal, state and local laws, regulations, codes and safety precautions that pertain to underground storage tanks and/or their associated systems.

20.1.3. Consult tank brochures, separate system instructions (such as oil/water separators) and separate accessory instructions, which are available upon request from the UST coordinator at the Xerxes plant nearest you. (*See SECTION 22.*)

20.1.4. Consult the applicable limited warranty for each tank for further operating guidelines and limitations. A copy of the limited warranty is available upon request from the UST coordinator at the Xerxes plant nearest you. (*See SECTION 21.*)

20.2. TEMPERATURE LIMITS FOR STORED PRODUCTS AND MATERIALS

20.2.1. Each Xerxes tank is designed to store materials identified in the manufacturer's applicable limited warranty.

CAUTION

Products and materials must be stored in the tank appropriate for the specific product or material. Failure to follow this caution may damage the tank and surrounding property.

CAUTION

Storing products and materials other than those identified in the manufacturer's applicable limited warranty will void Xerxes' obligations under the warranty and may cause tank failure or other property damage.

20.2.2. All products and materials must be stored at ambient temperature except as noted in Points 20.2.3. through 20.2.6.

20.2.3. The maximum temperature for storing fuel oils is 150° F.

20.2.4. The maximum temperature for storing nonpotable water is 150° F.

Note: Potable water is to be stored at ambient temperature.

20.2.5. The maximum temperature for storing wastewater products and materials is 150° F.

20.2.6. The maximum temperature for storing chemicals is 100° F.

CAUTION

Introducing or storing a product or material into a tank in excess of the allowable temperature may damage the tank. Failure to follow this caution may damage the tank and surrounding property.

20.3. ENTERING TANKS

20.3.1. Do not allow anyone to enter the tank unless it has been properly emptied and vented, and unless the person entering the tank has been trained in confined-space entry procedures and applicable OSHA regulations.

⚠ WARNING

Improper tank entry could cause fire, explosion or asphyxiation, and could result in death or serious injury.

20.4. FILLING PETROLEUM TANKS

20.4.1. Never overfill the tank.

20.4.2. Xerxes recommends only gravity-filling of tanks.

⚠ WARNING

Xerxes does not recommend pump- or pressure-filling of the tanks because an overfill or overpressurization could occur. Overfilling the tank while under pressure could cause tank failure even if the tank vent is unrestricted. Tank failure could result in death or serious injury.

20.4.3. Each time the tank is filled, the owner/operator must make sure the tank is properly vented. *(See SECTION 13.)*

20.4.4. Owner/operator must determine whether the tank has overfill protection, such as automatic shut-off devices ("flapper valves") or vent-restriction devices ("ball-float valves"), which will close off the internal piping and reduce the tank's capacity.

20.4.5. Owner/operator must notify whoever fills the tank that it has overfill protection, which reduces the tank's capacity.

20.4.6. Before each tank filling, owner/operator or the delivery service must determine the tank's reduced capacity due to the overfill protection, and consult the instructions or guidelines provided by the installer and manufacturer of the overfill-protection device to determine how much additional product the tank can hold.

⚠ WARNING

If owner/operator allows pump- or pressure-filling of the tank, owner/operator must ensure that the tank is not equipped with overfill protection, such as an automatic shut-off device or ball-float valve. Owner/operator must notify whoever will fill the tank that automatic shut-off equipment is required on the delivery truck to prevent an overfill and that overfilling the tank while under pressure could cause tank failure even if the tank vent is unrestricted. Failure to follow these instructions each time the tank is filled could cause an overfill, overpressurization or tank failure, and could result in death or serious injury.

21. LIMITED WARRANTIES

21.1. GENERAL

21.1.1. Each product is covered by a product-specific limited warranty, which contains operating guidelines and parameters that should be reviewed as applicable. A copy of the relevant Xerxes limited warranty is found in the printed material that accompanies each tank, in each applicable product brochure and on the Xerxes Web site (www.xerxescorp.com). It is also available upon request from the UST coordinator at the Xerxes plant nearest you.

22. SELECTED LIST OF SUPPLEMENTAL MATERIALS

22.1. GENERAL

22.1.1. Supplemental materials, which may apply to specific installations and/or conditions, are available upon request from the UST coordinator at the Xerxes plant nearest you or from technical support at Xerxes Minneapolis.

22.1.1.1. Among those materials available from the UST coordinator (and on the Xerxes Web site at www.xerxescorp.com) are the following:

- Backfill Guidelines
- Split Backfill Instructions
- Prefabricated Deadmen Installation Instructions
- Man-Out-of-Hole (MOH) Straps Instructions
- Watertight Cover Gasket Replacement Instructions
- New York City Double-Wall Tank Installation/Testing Supplement
- Triple-Wall Tank Preinstallation Testing Instructions
- Flexible Dipstick Monitoring Instructions
- Field Fiberglass Lay-Up Instructions for Containment Sumps
- Two-Part Sealant Mixing/Handling Instructions
- Single-Wall Containment Sump Installation Instructions for Flat-Sided Containment Sumps
- Single-Wall Containment Sump Installation Instructions for Round-Sided Containment Sumps
- Double-Wall Containment Sump Installation Instructions
- Large Bottom Sump Installation Instructions
- Flat-Bottom Containment Sump Installation Instructions.
- Preinstallation Testing Instructions (for Wastewater Tanks Factory-Equipped for Pressure-Testing).

22.1.1.2. Among those materials available from technical support at Xerxes Minneapolis are the following:

- Deep Burial Installation Guidelines
- Alternate Backfill (Sand) Installation Instructions
- Cast-in-Place Deadmen Installation.

23. RETAINING INSTALLATION MANUAL

23.1. GENERAL

23.1.1. After installation, tank installer must give Installation Manual with completed Tank Installation Checklist to tank owner.

23.1.2. After installation, tank owner must retain Installation Manual for future reference to operating guidelines.

XERXES® CORPORATION

Tank Installation Checklist

Fiberglass Underground Storage Tanks

Single-Wall (SW), Double-Wall (DW), Multicompartment (MC) and Oil/Water Separators (OWS)

Complete this checklist, and keep it with copies of any written authorizations for variations and/or deviations received from Xerxes.

- Date of Installation: _____ Tank Size and Capacity: _____
- Tank Type: (Circle those that apply.) SW DW MC OWS **and** Dry Wet UL Number: _____
- Site Owner: _____
- Site Address: _____
  STREET CITY STATE ZIP
- Installing Contractor: _____
  CONTRACTOR NAME STREET CITY STATE ZIP
- On-Site Supervisor: _____

1. PREINSTALLATION

Verified by:

A. Visual Inspection: No evidence of damage (holes, cracks, gouges) in tank. (Document any damage found.) ..... _____

B. Monitoring-Fluid Tanks: 1. Check and record monitoring-fluid level in reservoir. _____ (depth in inches) ..... _____
2. Check for monitoring fluid inside and outside of tank. ..... _____

C. Physical Test: Preinstallation air/soap test completed in accordance with installation instructions ..... _____

D. Backfill Material: (Indicate which type.) 1. Pea gravel or crushed stone as specified by Xerxes ..... _____
2. Other (Requires specific approval by Xerxes. Describe.) ..... _____

E. Excavation: Hole dimensions are correct per installation instructions for appropriate conditions. ..... _____

F. Internal Diameter Measurement: Internal diameter of the tank is measured & documented (Initial Internal Diameter in SECTION 4 below)... _____

G. Geotextile Utilized: (Indicate one.) 1. Yes 2. No ..... _____

H. Hole Condition: (Indicate one.) 1. Dry hole (Water is not anticipated to reach tank – area is not subject to flooding.) . ..... _____
2. Wet hole (Excavation may trap water – area is subject to flooding.) ..... _____

I. Traffic Loads: (Indicate one.) 1. Traffic loads anticipated ..... _____
2. No traffic loads anticipated ..... _____

J. Anchoring: Performed in accordance with installation instructions (Indicate one.) 1. None 2. Deadmen 3. Full slab ..... _____

K. Fittings and Other Metal Components: Coated to protect against corrosion ..... _____

2. DURING INSTALLATION

A. Backfill-material bed is level and is a minimum of 12 inches deep, over native soil or slab, before setting tank. ..... _____

B. Tank Spacing: Tanks are spaced correctly from each other and from excavation according to instructions. ..... _____

C. Visual Inspection: No evidence of damage is found after setting in hole. ..... _____

D. Hold-down Straps: Positioned and secured according to installation instructions. (See SECTION 7.5. of Installation Manual.) ..... _____

E. Backfill Compacted: Material has been tamped and/or compacted to fill all voids around tank. ..... _____

F. Tank is properly ballasted during backfilling: (wet-hole installation only) ..... _____

G. Tank(s) are buried at proper depth to conform to appropriate conditions: (wet, dry, traffic or no traffic) ..... _____

H. All piping connections are flexible connections ..... _____

3. POSTINSTALLATION

A. Physical Test for Air-Testable Tanks: Air/soap test is completed according to installation instructions..... _____

B. Optional Hydrostatic Test: Hydrostatic test is completed according to installation instructions..... _____

C. Internal Diameter Measurement: The internal diameter of the tank is measured and documented. (Final Internal Diameter in SECTION 4 below) ..... _____

D. Monitoring-Fluid Tanks: 1. Set the level of the monitoring fluid after backfilling and top-slab placement is completed.
2. Check and record monitoring-fluid level in the reservoir. _____(depth in inches) ..... _____
3. Check for monitoring fluid inside tank. ..... _____

E. Containment Sump Water Test: Add water to the containment sump assembly to check for leaks..... _____

F. Installation Manual: Deliver Installation Manual and Operating Guidelines with the completed Checklist to owner..... _____

4. DEFLECTION MEASUREMENT

All tanks must be measured to determine vertical deflection. Follow deflection-measurement instructions (SECTION 16) in the Installation Manual. An initial internal-diameter measurement is taken and recorded as a point of reference. Subsequent internal-diameter measurements show tank deflection and can be compared to the table below. Take each measurement from the same fitting using the same procedure.

External Tank Diameter (Feet)	4	6	8	10	12
Allowable Deflection (Inches)	1/2	3/4	1-1/4	1-1/2	1-3/4

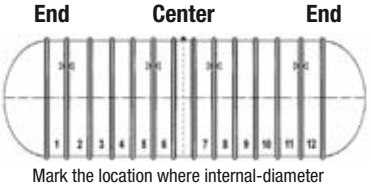
Internal-Diameter Measurements

Initial Internal Diameter (before backfilling) _____

Final Internal Diameter (after backfilling) _____

Initial Internal Diameter minus
Final Internal Diameter = Deflection _____

Verified by: _____



Mark the location where internal-diameter measurements were taken.

XERXES® CORPORATION

Tank Handling Data

Single-Wall (SW) and Double-Wall (DW) Tanks

(See the Xerxes Multicompartment Tank brochure for multicompartment tank data.)

Nominal Tank Diameter (Ft.) (SW & DW)	Nominal Tank Capacity (Gal.) (SW & DW)	Actual Tank Capacity * (Gal.)		Actual Tank Diameter ** (Ft./In.)		Actual Tank Length (Ft./In.)		Nominal Tank Weight *** (Lb.)		
		SW	DW	SW	DW	SW	DW	SW	DW Dry	DW Wet
4	600	602	602	4'-1/2"	4'-1"	6'-11 7/8"	7'-3 1/2"	500	800	1,000
	1,000	1,009	1,009	4'-1/2"	4'-1"	11'-3 7/8"	11'-7 1/2"	700	1,100	1,400
6	2,000	2,376	—	6'-3 1/2"	—	13'-5 3/4"	—	1,000	—	—
	2,500	—	2,324	—	6'-3 1/2"	—	13'-5 3/4"	—	1,800	2,400
	3,000	2,973	2,910	6'-3 1/2"	6'-3 1/2"	16'-4 1/4"	16'-4 1/4"	1,200	2,100	2,800
	4,000	4,131	3,789	6'-3 1/2"	6'-3 1/2"	21'-11 1/8"	20'-8"	1,600	2,500	3,500
	5,000	5,064	4,961	6'-3 1/2"	6'-3 1/2"	26'-5"	26'-5"	1,900	3,100	4,300
	6,000	5,960	5,840	6'-3 1/2"	6'-3 1/2"	30'-8 3/4"	30'-8 3/4"	2,200	3,600	4,900
8	2,000	2,189	—	8'-0"	—	9'-1/2"	—	900	—	—
	3,000	3,271	—	8'-0"	—	12'-3"	—	1,200	—	—
	4,000	4,218	4,190	8'-0"	8'-0"	15'-1/2"	15'-1/2"	1,400	2,200	3,100
	5,000	5,165	5,089	8'-0"	8'-0"	17'-8 1/2"	17'-8 1/2"	1,700	2,600	3,700
	6,000	6,084	6,044	8'-0"	8'-0"	20'-6 1/2"	20'-6 1/2"	2,000	2,900	4,300
	8,000	7,950	7,899	8'-0"	8'-0"	26'-1/2"	26'-1/2"	2,500	3,600	5,400
	10,000	9,816	9,753	8'-0"	8'-0"	31'-6 1/2"	31'-6 1/2"	3,000	4,300	6,600
	12,000	11,682	11,608	8'-0"	8'-0"	37'-1/2"	37'-1/2"	3,500	5,000	7,700
	15,000	14,975	14,881	8'-0"	8'-0"	46'-9"	46'-9"	4,500	6,400	9,800
10	10,000	10,563	10,420	10'-4"	10'-4"	21'-5 1/4"	21'-5 1/4"	3,200	4,500	6,200
	12,000	12,068	11,904	10'-4"	10'-4"	24'-1/4"	24'-1/4"	3,600	5,000	7,000
	15,000	15,248	15,041	10'-4"	10'-4"	29'-5 3/4"	29'-5 3/4"	4,500	6,100	8,600
	20,000	20,055	19,782	10'-4"	10'-4"	37'-8 3/4"	37'-8 3/4"	5,700	7,700	11,000
	25,000	25,783	25,431	10'-4"	10'-4"	47'-6 3/4"	47'-6 3/4"	7,900	10,000	14,300
	30,000	30,590	30,172	10'-4"	10'-4"	55'-9 3/4"	55'-9 3/4"	9,400	11,900	17,000
	35,000	35,397	34,912	10'-4"	10'-4"	64'-3/4"	64'-3/4"	10,500	13,600	19,600
	40,000	41,004	40,443	10'-4"	10'-4"	73'-8 1/4"	73'-8 1/4"	12,100	16,000	23,000
12	20,000	20,781	—	11'-11"	—	29'-4"	—	9,200	—	—
	25,000	25,541	—	11'-11"	—	35'-7"	—	10,600	—	—
	30,000	31,253	—	11'-11"	—	43'-1"	—	12,500	—	—
	35,000	36,013	—	11'-11"	—	49'-4"	—	13,900	—	—
	40,000	39,821	—	11'-11"	—	54'-4"	—	15,000	—	—
	48,000	48,389	—	11'-11"	—	65'-7"	—	17,700	—	—
	50,000	50,293	—	11'-11"	—	68'-1"	—	18,300	—	—

* If an overfill-protection device, such as a ball-float or flapper valve, is installed in the tank, the actual tank capacity will be reduced.

** Actual height of the tank may be greater than actual tank diameter due to fittings and accessories. Load height during shipping may vary due to tank placement on shipping trailer.

*** Adding accessories to the tank may increase the tank weight.

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