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Installation Manual and Operating Guidelines

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XERXES INSTALLATION MANUAL AND OPERATING GUIDELINES

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XERXES INSTALLATION MANUAL AND OPERATING GUIDELINES

Read all instructions and operating guidelines before installation.

These instructions, which are based on successful experiences in a wide variety of situations, are issued as a guide for the installation of Xerxes underground storage tanks. Compliance with the procedures and instructions contained in this Installation Manual are necessary for the proper installation of Xerxes tanks. Failure to comply will void the limited warranty for the tank(s) and may cause tank failure.

To Installer: Before installation, read and understand the Installation Manual and Operating Guidelines (subsequently referred to as Installation Manual). After installation, give the Installation Manual with the completed Tank Installation Checklist (back of manual) to the tank owner.

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

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 understand and follow all requirements contained in this Installation Manual.

1.1.2. Work must be performed according to standard industry practices that may apply to all aspects of tank installations and operations.

1.1.3. Comply with all applicable federal, state and local 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”).

NOTE: A U.S. federal law (the Resource Conservation and Recovery Act (RCRA), as amended (Pub. L. 98–616)) requires owners of certain underground storage tanks to notify designated state or local agencies by May 8, 1986, of the existence of their tanks. Notifications for tanks brought into use after May 8, 1986, must be made within 30 days. Consult EPA’s latest regulations to determine if you are affected by this law.

1.1.4. For additional information, contact relevant state, county and city storage-tank authorities, including health, fire or building departments, and environmental agencies.

1.1.5. 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.

1.1.6. 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.

1.1.7. 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 read and understand OSHA’s Standard, Part 1926, Subpart P (Excavations), 650-652. A copy of this standard is available free of charge at www.osha.gov.

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

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

1.1.10. 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.

1.2. 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’ obligations under the limited warranty, may result in tank failure or property damage, and could cause serious personal injury or death.

1.2.1.1. The presence of a Xerxes representative does not relieve the installer of responsibility for proper installation of the tank.

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 18* of this Installation Manual. It is the responsibility of the owner to retain this Installation Manual for future reference to operating guidelines.

1.2.3.1. A copy of the applicable Xerxes limited warranty is found in the shipping documents that accompany each tank when delivered.

1.2.3.2. A copy of the applicable Xerxes limited warranty is also found in some of the applicable product brochures, at www.xerxes.com and upon request from the Xerxes customer service coordinator.

1.2.4. Use the Tank Installation Checklist (back of manual) for all single-wall tanks (SW), double-wall tanks (DW), oil/water separators (OWS) and multicompartment tanks (MC) as the installation proceeds.

1.2.5. Relevant information for each tank installed must be recorded on the Tank Installation Checklist found at the back of this manual. Consult the Xerxes customer service coordinator if additional checklist forms are needed.

1.2.6. The tank owner should retain a copy of the completed Tank Installation Checklist in order to facilitate any warranty claim.

1.2.7. Xerxes recommends that the installing contractor also keep a copy of the completed Tank Installation Checklist.

1.2.8. Xerxes must authorize—in writing and prior to tank installation—any variation to, or deviation from, the instructions in the Installation Manual.

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

1.2.9. For any questions regarding the interpretation of these instructions or for any other technical inquiries, contact technical support at Xerxes Minneapolis, MN.

1.2.10. All contact information applicable to installation is found on the back cover of this manual.

1.3. EQUIPMENT

1.3.1. The following list is to be used as a guide for the equipment recommended for installing Xerxes tanks:

1.3.1.1. excavation equipment capable of producing a level bottom hole and placing backfill material at any point in the excavation

1.3.1.2. suitable lifting equipment capable of lifting and placing the tanks and associated tank anchors

1.3.1.3. spirit level or transit

1.3.1.4. 50-foot tape measure

1.3.1.5. tamping rod(s)

NOTE: A long wooden shovel handle is satisfactory.

1.3.1.6. pipe wrenches and appropriate pipe joint compound

1.3.1.7. a test manifold for each air-testable tank or compartment—*see FIGURE 3-2*

1.3.1.8. source of pressurized air capable of 6 psig

1.3.1.9. soap and water solution (during freezing conditions, a suitable solution such as windshield wiper fluid may be added to the soap and water mixture)

1.3.1.10. soft cloth, brush or hand-held pneumatic sprayer

1.3.1.11. hand shovel

1.3.1.12. lifting sling(s)

1.3.1.13. soil compacting equipment (if necessary).

2. HANDLING AND STORING TANKS

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 loading, unloading, handling and storage at the jobsite.

2.1.2. Move tanks by lifting and setting only. Do not move tanks by rolling or dragging.

2.1.3. Always lift tanks by using the lifting lugs provided with the tank. Distribute the lifting load evenly between the lifting lugs. Use spreader bars and equal length slings as required.

NOTE: Larger tanks may be provided with guide lugs for attachment of guide ropes during lifting and positioning operations. Do not use guide lugs for lifting.

CAUTION

Never roll, drag or drop the tank. This may result in damage to the tank.

2.2. UNLOADING AND HOISTING TANKS

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

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

2.2.1.2. Sign the shipping papers accepting the tank as delivered. Any damage observed must be noted in these papers.

2.2.1.3. Be sure that all equipment used to lift the tank is rated to handle the load.

2.2.1.4. Select a smooth, solid, level area on which to place the tank, and clear that area of all large rocks, trash and debris.

2.2.1.5. Make sure that all tools and other items that may damage the tank during unloading are removed from the trailer bed.

2.2.2. 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) and until anyone in a position to be injured by the tank's movement is in a safe location. Failure to do so could result in death, serious injury or property damage.

2.2.3. When hoisting the tank, follow these instructions—*see FIGURE 2-1 and FIGURE 2-2:*

2.2.3.1. Choose suitable lifting sling(s) for the tank being installed.

2.2.3.2. When using multiple lifting lugs, the angle of the lifting sling should never exceed 30 degrees—*see FIGURE 2-1.*

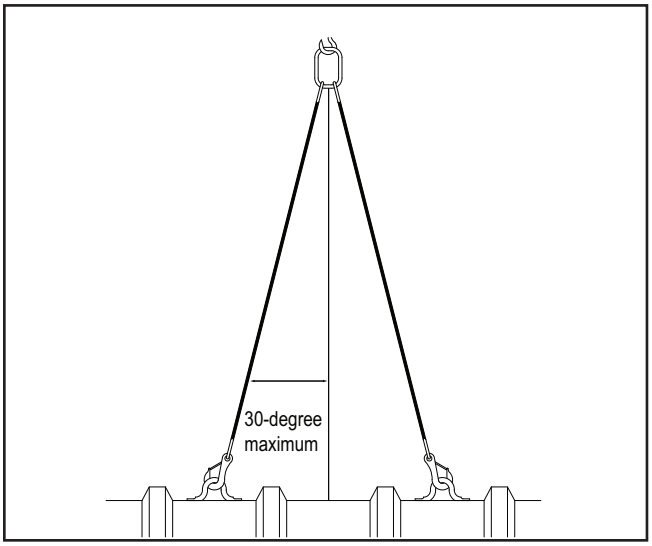


FIGURE 2-1

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

2.2.3.4. 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.*

2.2.3.4.1. To unload these tanks, use the lifting lugs that are situated on top of the tank in its rotated position.

2.2.3.4.2. 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.*

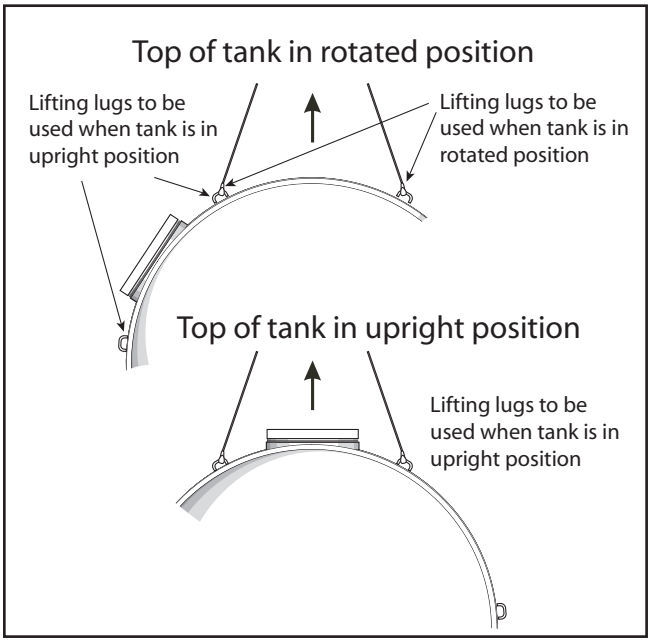


FIGURE 2-2

2.2.4. Do not wrap chain or cable around the tank at any time, including when securing the tank on the ground.

2.2.5. Use guide ropes to guide the tank when needed.

2.2.6. 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.

2.3. STORING TANKS

2.3.1. Whenever a tank is temporarily placed above the ground at the site, place it on a smooth, solid, level area that is clear of large rocks, trash and debris, and then chock it in place to prevent rolling. *See FIGURE 2-3.*

⚠ 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.

2.3.2. Tie the tank down if high winds are expected. **Do not use wire rope or chains.** *See FIGURE 2-3.*

2.3.2.1. Never place tie-down straps over collars or reservoirs.

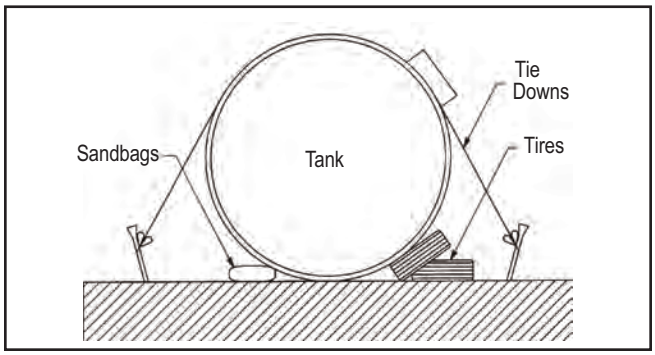


FIGURE 2-3

2.3.3. Whenever a tank is temporarily placed above the ground 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 result in damage to the tank and/or collar.

2.3.4. Ensure that the tank is UV-protected if it will be stored above the ground for an extended period of time, typically 12 months depending on the geographic location of installation.

3. PREINSTALLATION INSPECTION AND TESTING

3.1. GENERAL

⚠ 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

Do not put product in the tank until all necessary preinstallation inspection and testing is completed. Failure to follow this caution may result in property damage.

3.1.1. The applicable inspection and testing procedures *set forth in SECTIONS 3 and 4* must be performed to validate the limited warranty.

3.1.2. All tanks are tested and inspected at the factory prior to shipment. However, in order to verify the absence of any damage resulting from shipping or handling, prior to installation all tanks must also be inspected at the site. Some tanks must also be tested at the site prior to installation according to the applicable procedures.

⚠ 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 follow this warning 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. Failure to follow this warning could result in death or serious injury.

3.1.3. Not all tanks are air-testable in the field. If a tank needs to be hydrostatically tested, *see SECTION 13.3.*

3.1.4. If the tank is a water/wastewater tank equipped for optional preinstallation testing, after inspecting the tank *(see SECTION 3.2.)*, *follow procedures in the Xerxes supplement, Preinstallation Testing Instructions for Water/Wastewater Tanks Factory-Equipped for Pressure Testing. See SECTION 20* for information on how to obtain this supplement.

3.1.5. If damage of any kind is detected, contact the plant from which the tank was shipped before installing the tank.

NOTE: Do not attempt unauthorized repairs.

3.2. INSPECTING THE TANK

3.2.1. Thoroughly inspect the entire outside surface of the tank for signs of shipping or handling damage. Rotate or lift the tank to inspect the bottom of the tank.

3.2.2. If damage of any kind is detected, contact the plant from which the tank was shipped before installing the tank.

NOTE: Do not attempt unauthorized repairs.

3.3. PRETESTING PROCEDURES

CAUTION

Do not install any piping or fittings other than test fittings until all preinstallation testing has been completed. Failure to follow this caution may result in property damage.

CAUTION

Never pressurize a wet interstitial space. Doing so may result in damage to the primary tank and/or tank failure.

3.3.1. All UL-labeled tanks, chemical tanks and potable water tanks must be air tested after backfill is brought close to the top of the tank.

3.3.2. If the tank being installed is not an air-testable tank, *proceed to SECTION 5*.

3.3.3. *See SECTIONS 3.4. through 3.9.* for specific instructions for preinstallation testing procedures.

3.3.4. *See SECTION 4* for preinstallation testing instructions for specific types of air-testable tanks.

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

3.3.6. Prior to the pressure test, remove all plugs, apply sealant, and replace and tighten plugs.

⚠ WARNING

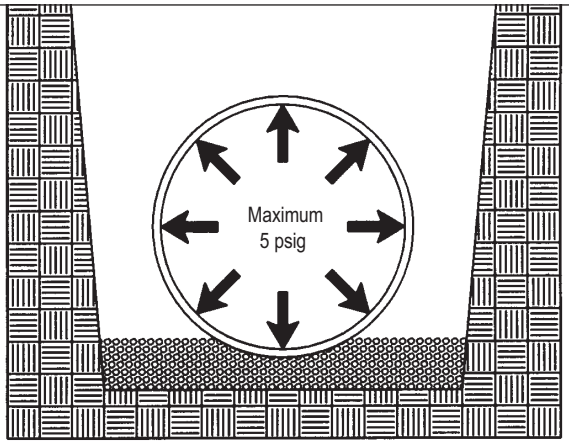
When the tank is under pressure, the manways, access openings and/or fittings may dislodge, or the tank could rupture, and this could result in death or serious injury. Before beginning the air test, notify all people on the test site to remain in a safe location. NEVER LEAVE A TANK UNDER PRESSURE UNATTENDED. Stand clear of manways, fittings and tank ends during the test.

3.4. PREPARING THE TANK FOR AIR TESTING

3.4.1. The air test pressure is 5 psig (3 psig for 12-foot-diameter tanks). *See FIGURE 3-1.*

⚠ WARNING

Do not overpressurize the tank. Position the pressure gauges so that the pressure readings can be clearly read at all times. The pressure gauge must have a pressure-relief valve that is used and set at 6 psig (4 psig for 12-foot-diameter tanks). Failure to follow this warning could result in death or serious injury.



Note: Maximum is 3 psig for 12-foot-diameter tanks.

FIGURE 3-1

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

3.4.3. Construct a test manifold with two pressure gauges *as shown in FIGURE 3-2*. Each pressure gauge must have a maximum full-scale reading of 15 psig with graduations in 1/2 psig increments, and a pressure-relief valve set at 6 psig (4 psig for 12-foot-diameter tanks).

3.4.3.1. When air testing multicompartment tanks, a test manifold is needed for each compartment. *See FIGURE 3-2.*

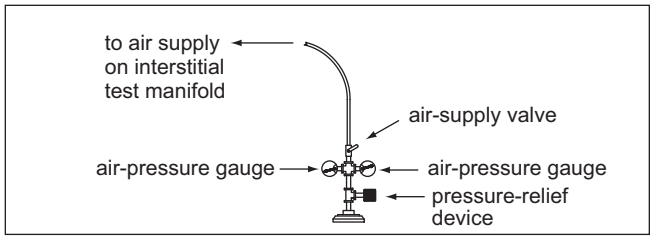


FIGURE 3-2

NOTE: All compartments on a double-wall tank may be manifolded together and tested simultaneously, or each compartment may be tested separately.

3.4.3.2. A test manifold is needed for testing the dry interstitial space of an air-testable, double-wall tank. *See FIGURE 3-2.*

NOTE: A test manifold is not required for a tank with an interstice filled with monitoring fluid.

3.4.4. During air tests, ambient air temperature can affect pressure-gauge readings.

⚠ CAUTION

Allow for pressure variations when tanks are subject to abrupt temperature changes. Failure to follow this caution may result in minor or moderate injury.

3.4.5. When testing tanks with wet monitoring, remove the reservoir-fitting plug.

3.4.6. 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.

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

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

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

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

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

3.5. PRESSURIZING THE PRIMARY TANK

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

3.5.2. If the interstitial space is dry, install the test manifold and close the valve before pressurizing the primary tank.

3.5.3. Open the air-supply valve and pressurize the primary tank to 5 psig (3 psig for 12-foot-diameter tanks). Allow a few minutes for the air temperature in the tank to stabilize, then allow the pressure to stabilize by adding or removing air as necessary.

3.5.4. Hold and monitor the pressure for a minimum of 1 hour.

3.5.4.1. If the test manifold shows a pressure build-up in the interstitial space of a dry-monitor, double-wall tank, contact the plant from which the tank was shipped.

NOTE: Do not attempt unauthorized repairs.

3.6. PRESSURIZING THE INTERSTITIAL SPACE IN A DRY TANK

⚠ WARNING

Never lift or hoist a tank under pressure. Failure to follow this warning could result in death or serious injury.

NOTE: Do not attempt unauthorized repairs.

3.6.1. Tanks with a dry interstitial space not shipped under vacuum come with a quick-disconnect assembly. *See FIGURE 3-3.*

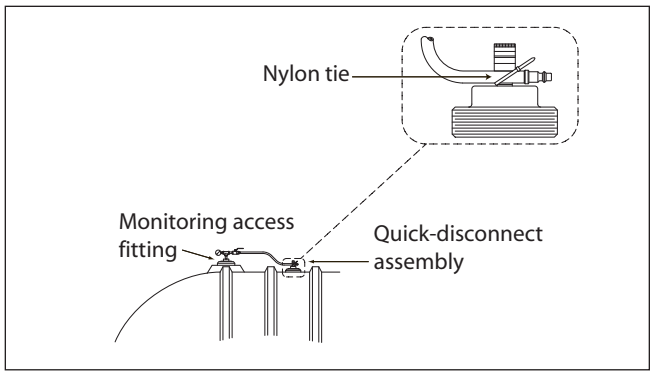


FIGURE 3-3

3.6.2. If the tank is not configured *as shown in FIGURE 3-3* prior to preinstallation testing, contact the plant from which the tank was shipped.

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

3.6.4. Maintain the pressure in the primary tank.

CAUTION

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

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

3.6.6. Insert the hose into the quick-disconnect fitting. This will allow air to transfer from the primary tank to the interstitial space.

3.6.7. Reconnect the air-supply line. Allow the pressure to stabilize at 5 psig (3 psig for 12-foot-diameter tanks) by adding or removing air as necessary.

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

3.7. SOAPING THE TANK

3.7.1. After pressurizing the tank, soap the tank to check the tank's integrity.

3.7.1.1. Soap either the fittings, manways and covers or 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 SECTION 4 instructions* for specific types of tanks.

3.7.1.2. Watch for active air bubbles. **There should not be any.**

NOTE: During freezing conditions, a suitable solution such as windshield washer fluid may be added to the soap and water mixture.

3.7.2. When doing a soap test, rotate the tank to check the bottom. **Do not rotate a tank filled with monitoring fluid.**

3.7.2.1. Before rotating the tank, 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.

3.7.2.2. 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.

3.7.3. If damage is detected, contact the plant from which the tank was shipped.

NOTE: Do not attempt unauthorized repairs.

3.8. PERFORMING VISUAL 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. Doing so may result in damage to the tank and/or tank failure.

3.8.1. Check that the tank has monitoring fluid in the reservoir. Measure the level of the monitoring fluid in the reservoir.

NOTE: If the reservoir is less than a third full, contact the plant from which the tank was shipped. See the back cover of the Installation Manual for contact numbers.

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

3.8.2.1. When checking a multicompartment tank, inspect the interior of each compartment for monitoring fluid.

3.8.3. Visually 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.**

3.8.3.1. When checking a multicompartment tank, inspect the exterior of each compartment for monitoring fluid.

3.9. RELEASING PRESSURE FROM THE TANK

3.9.1. If there is an interstitial space to pressurize, open the valve of the test manifold and carefully release the air pressure in the interstitial space first.

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

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

CAUTION

Never allow the pressure in the interstitial space to be greater than the pressure in a primary tank. Failure to follow this caution may result in damage to a primary tank and/or 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 manifolds and replace the protective covers in the service fittings.

4. PREINSTALLATION TESTING FOR SPECIFIC TYPES OF AIR-TESTABLE TANKS

NOTE: When air testing a tank, follow the procedures outlined here for the specific type of tank being installed. For more specific details on these procedures, *see the SECTION 3 SECTIONS and SUBSECTIONS to which you are referred.*

4.1. AIR TESTING A SINGLE-WALL TANK

4.1.1. Prepare the tank for air testing. *See SECTION 3.4.*

4.1.2. Pressurize the tank. *See SECTION 3.5.*

4.1.3. Soap the entire exterior of the tank. *See SECTION 3.7.*

4.1.4. Hold and monitor the pressure for a minimum of 1 hour.

4.1.5. Carefully release the air pressure from the tank. *See SECTION 3.9.*

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

4.2. TESTING A WET DOUBLE-WALL TANK

CAUTION

Never pressurize a wet interstitial space. Doing so may result in damage to the primary tank and/or tank failure.

4.2.1. Check the level of the monitoring fluid in the reservoir. *See SECTION 3.8.* for instructions.

4.2.2. Visually check the interior and the exterior of each compartment for the presence of monitoring fluid. *See SECTION 3.8.* for instructions.

4.2.3. If the monitoring fluid is not at the proper level, and/or monitoring fluid is found on either the interior or the exterior of any compartment, contact the plant from which the tank was shipped.

4.2.4. If there is no monitoring fluid on either the interior or the exterior of any compartment, proceed to backfill the tank to the top of the tank.

4.2.5. After the tank is backfilled to the top of the tank, it must be air tested. *See SECTION 13* for instructions.

4.3. TESTING A DRY-MONITOR, DOUBLE-WALL TANK WITH THE INTERSTITIAL SPACE UNDER VACUUM

4.3.1. A dry-monitor, double-wall tank may be shipped from the factory with the interstitial space under vacuum. This option allows for monitoring the tank during shipping and handling, and may expedite tank installation by shortening

preinstallation testing procedures. The date that the vacuum was applied is on a label by the monitor or on the shipping documentation delivered with the tank.

4.3.1.1. This date may be used as a reference under this procedure to evaluate the tank's integrity prior to installation, and to validate Xerxes' obligations under the limited warranty.

4.3.1.2. Xerxes tanks shipped under vacuum must be under vacuum for a minimum of 7 days. If this requirement is not met, an air/soap test is required. *See SECTION 4* for instructions.

4.3.1.3. The tank shipped under vacuum should be installed and backfilled with the vacuum intact if both of the following two conditions are met:

4.3.1.3.1. installation of the tank is to begin 7 days or more after the factory application of vacuum (as indicated on the shipping documents and/or tank labels)

4.3.1.3.2. the vacuum gauge shipped with the tank reads 12 inches of mercury or more.

NOTE: The vacuum-monitoring method is less sensitive and less reliable than the soap test *described in SECTION 3.7*. Under certain field conditions (such as major changes in temperature, barometric pressure and/or altitude) and/or with certain equipment failure (such as freezing or sticking of gauge mechanism), the vacuum-monitoring method may not be an accurate enough test. When in doubt, or when such conditions occur, Xerxes recommends *SECTION 4.4. or 4.5. (whichever is applicable)* as the preferred preinstallation test procedure.

4.3.1.4. After the tank is backfilled to the top of the tank, the tank must be air tested. *See SECTION 13* for instructions.

4.3.1.5. If either or both of the conditions *stated in POINTS 4.3.1.3.1. and 4.3.1.3.2.* are not met, *follow the procedures of SECTION 4.4. or 4.5. (whichever is applicable)* for the preinstallation test.

4.3.1.5.1. If the gauge reads less than 12 inches of mercury, perform a visual inspection of the exterior of the tank and the vacuum gauge fittings to evaluate the tank's integrity, and contact the plant from which the tank was shipped.

NOTE: Do not attempt unauthorized repairs.

4.3.1.6. Record the vacuum gauge reading at the time of installation *on the Tank Installation Checklist*.

4.4. AIR TESTING A DRY-MONITOR, DOUBLE-WALL TANK

4.4.1. Prepare the tank for air testing. *See SECTION 3.4.*

4.4.2. Pressurize the primary tank. *See SECTION 3.5.*

4.4.3. Soap all service fittings and manways. *See SECTION 3.7.*

4.4.4. Hold and monitor the pressure in the primary tank for a minimum of 1 hour.

4.4.5. Use the quick disconnect assembly to pressurize the interstitial space. *See SECTION 3.6.*

4.4.6. Soap the entire exterior of the tank. *See SECTION 3.7.*

4.4.7. Hold and monitor the pressure in the interstitial space for a minimum of 1 hour.

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

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

4.5. AIR TESTING A DRY-MONITOR, DOUBLE-WALL MULTICOMPARTMENT TANK NOT UNDER VACUUM

CAUTION

Do not connect air supply directly to the interstitial-space monitoring access fitting. Pressurizing the interstitial space by itself may result in damage to the primary tank and/or tank failure.

4.5.1. Prepare the tank for air testing. *See SECTION 3.4.*

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

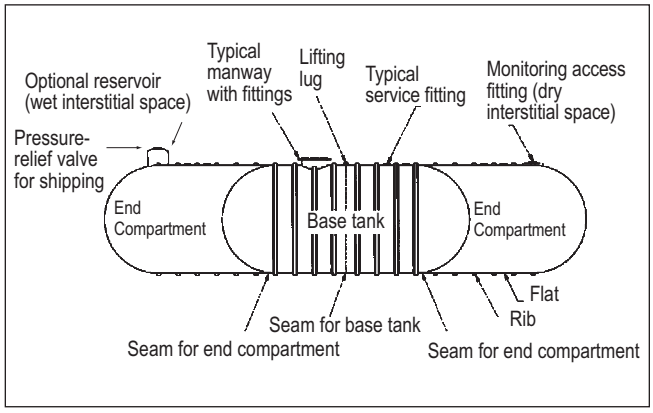


FIGURE 4-1

4.5.2. Pressurize the primary tank. *See SECTION 3.5 and FIGURE 4-2.*

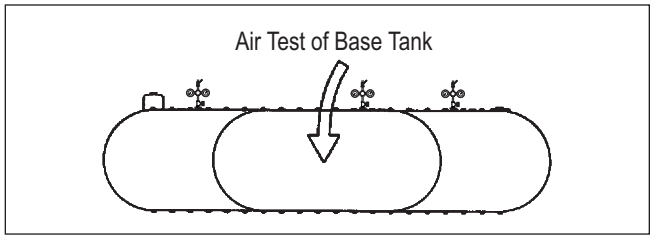


FIGURE 4-2

4.5.3. Pressurize the end compartment(s). *See SECTION 3.5. and FIGURE 4-3.*

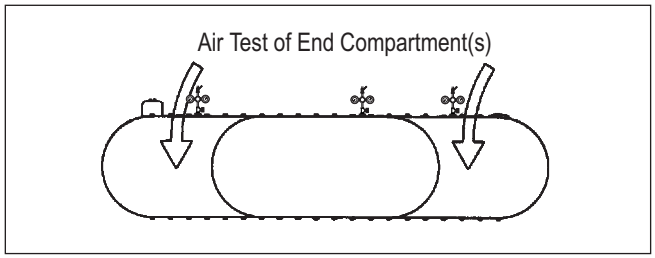


FIGURE 4-3

4.5.4. Soap all service fittings, manways and covers. *See SECTION 3.7.*

4.5.5. Hold and monitor the pressure for a minimum of 1 hour.

4.5.6. Use the quick-disconnect assembly to pressurize the interstitial space. *See SECTION 3.6. and FIGURE 4-4.*

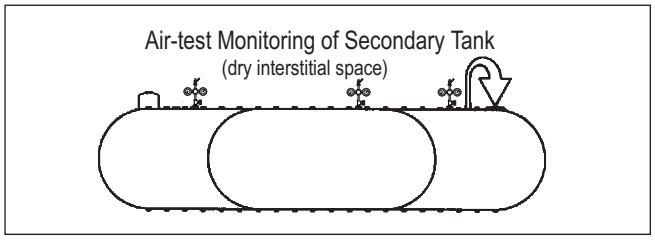


FIGURE 4-4

4.5.7. Soap the entire exterior of the tank. *See SECTION 3.7.*

4.5.8. Hold and monitor the pressure for a minimum of 1 hour.

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.

5. INSTALLING TANKS

⚠ 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 could 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 could result in death or serious injury. Tanks should be air tested before ballasting. *See SECTION 12.*

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 result in damage to the tank and/or surrounding property.

5.1. GENERAL

5.1.1. Take safety precautions throughout the entire installation process. *See SECTIONS 1.1. and 7.1.*

5.1.2. Use only approved backfill material. *See SECTION 6.*

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

5.1.4. Do not use in situ soil as primary backfill material.

5.1.5. Typically, all excavated in situ soil must be replaced with primary backfill material.

5.2. DRY-HOLE INSTALLATION

5.2.1. Before beginning tank installation, take a tank diameter measurement. *See SECTION 11* for instructions.

5.2.2. Record this measurement as Measurement #1 on the Tank Installation Checklist.

5.2.3. Locate the excavation site *according to instructions in SECTIONS 7.1. and 7.2.*

5.2.4. Prepare the excavation *according to instructions in SECTION 7.*

5.2.4.1. When preparing the excavation, allow for an anchoring system (if used) and geotextile fabric (if used). *See SECTIONS 7.2., 7.3. and 7.4.*

5.2.4.2. When preparing the excavation, allow for the appropriate depth of cover *as specified in SECTION 7.4*.

5.2.4.3. If two or more tanks are to be installed in the same excavation hole, *follow instructions in SECTION 7.5.*

5.2.4.4. If the tank has a bottom sump or fitting, prepare the excavation hole *according to instructions in SECTION 10.*

5.2.5. Remove all loose material from the excavation.

5.2.6. Where necessary, level the bottom of the excavation using primary backfill material, filling in any low areas. *See SECTION 6* for backfill requirements.

5.2.7. If an anchor slab is needed, install it now. *See POINT 7.5.3.3. and SECTION 8.6.*

5.2.8. If geotextile fabric is to be used, place it in the excavation hole at this time. *See SECTION 9.*

5.2.8.1. Geotextile must be placed to separate the primary backfill material from all other in situ soil and/or secondary backfill material.

5.2.9. If deadmen are used, *see SECTION 8* for information on deadmen placement and place them now.

5.2.9.1. If deadmen are used and they are to be placed so that they are in the bedding or below the bottom of the tank, place the deadmen before preparing the backfill bedding.

5.2.10. Prepare a 12-inch-thick smooth, level bed of approved primary backfill material on the bottom of the excavation. *See SECTION 6* for backfill requirements.

CAUTION

If anchor straps are used, bedding must be carefully leveled. Failure to follow this caution may result in straps being too short or too long, and may result in property damage.

5.2.10.1. If the excavation has soft soil conditions or if there might be difficulties controlling water accumulation, it is acceptable to increase the bedding thickness to 18 inches and set the tank anchors 6 inches off the bottom of the excavation (9 inches for 10-foot-diameter tank deadmen).

5.2.11. *See SECTION 2* regarding the use of lifting lugs to hoist the tank when unloading and installing it.

5.2.12. Place the tank or tanks onto the bed.

5.2.12.1. If deadmen are in place, center the tanks between them.

CAUTION

Do not set tanks directly onto a concrete slab, timbers, cradles or in situ soil. Failure to follow this caution may result in damage to the tank.

5.2.12.2. Align the tanks with anchors for proper placement of anchor straps.

5.2.12.3. As the tank is being placed, slope the tank according to site specifications.

NOTE: Xerxes does not require that a tank be sloped. The slope is determined by the tank owner's specifications.

5.2.12.3.1. Sloping of tanks may affect accuracy of calibration charts.

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

5.2.13. 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.

5.2.14. If anchor straps are to be used, install them at this time*. See SECTION 8.2.*

5.2.14.1. The locations for anchor straps are marked on tank ribs by the arrowhead symbol ▶◀ (on the tank itself on 4-foot-diameter tanks).

5.2.14.2. All marked anchor strap locations must have straps.

CAUTION

Do not place straps between ribs. Failure to properly place straps may result in damage to the tank.

5.2.14.3. Place a strap on each marked location and install anchoring hardware. *See SECTION 8.*

5.2.14.4. Tighten each anchor strap until it is snug over the rib (over the tank itself in 4-foot-diameter tanks) but causes no deflection of the tank. Straps must be uniformly tight.

5.2.14.5. The elevation of deadmen is critical. If a strap appears too short or there is not sufficient adjustment in the turnbuckle to make the strap snug, the tank and/or tank anchors must be repositioned by adding or removing backfill material until the straps are properly installed.

NOTE: Make sure that the minimum bedding thickness of 12 inches has been maintained.

5.2.14.6. After the straps have been installed and tightened, take a tank diameter measurement to check tank deflection, and record it as Measurement #2 on the Tank Installation Checklist.

CAUTION

Overdeflection of the tank may result in damage to the tank.

5.2.15. On water/wastewater tanks with bottom fittings, piping needs to be installed at this time.

5.2.16. Place approximately 12 inches of primary backfill around the bottom of the tanks between the ribs (if present) and under the end domes.

5.2.16.1. Use a nonmetal tamping rod long enough to reach beneath the tank to push material under the tank body and domes until solid resistance is felt, all voids are filled and the tank is fully supported. *See FIGURE 5-1.*

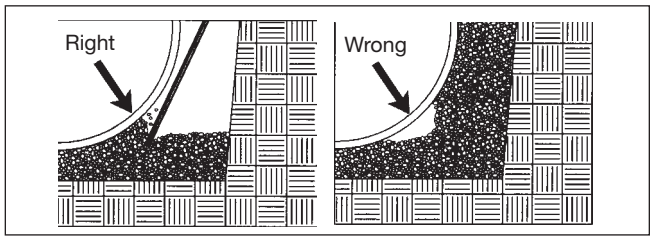


FIGURE 5-1

CAUTION

Do not use metal probes. Failure to follow this caution may result in damage to the tank.

NOTE: An object like a long wooden shovel handle is a practical choice as a tamping rod.

CAUTION

Do not strike the tank with the tamping rod. Failure to heed this caution may result in damage to the tank.

5.2.17. *Repeat POINTS 5.2.16. and 5.2.16.1.* with a second lift of approximately 12 inches of primary backfill.

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

5.2.18.1. Place backfill material evenly on opposite sides of the tank so that the tank does not shift.

5.2.19. If secondary backfill material is to be used on the perimeter of the installation, it must be placed and compacted at the same time as the primary backfill material.

5.2.20. During the backfilling process, it is good practice to continue to check tank deflection.

CAUTION

Thoroughly hand tamp backfill to eliminate all voids under the tank. Do not allow the tank to shift during the backfill procedure. If there are voids under the tank and/or the tank has shifted (and the backfill is above one-quarter (1/4) of the tank diameter), it may be necessary to remove and reinstall the tank. Failure to follow this caution may result in damage to the tank and/or property damage.

5.2.21. After backfill has been brought to the top of the tank, take another tank diameter measurement. Record it as Measurement #3 in the Tank Installation Checklist, and determine whether tank deflection is within the allowable limits *shown in TABLE 11-1.*

5.2.22. All UL-labeled tanks, chemical tanks and potable water tanks must be air tested after backfill is brought close to the top of the tank.

5.2.23. If additional testing (postinstallation testing for air-testable tanks or optional hydrostatic testing) is to be done, perform those tests now. *See SECTION 13* for instructions.

5.2.24. Typically, the tank should be ballasted at this time. *See SECTION 12* for instructions.

5.2.25. If piping and/or venting needs to be installed, complete this work now. *See SECTION 14* for instructions.

5.2.26. If containment sumps need to be installed, do that now. *See SECTION 16* for instructions.

5.2.27. Continue to backfill to grade, or to subgrade if reinforced concrete or asphalt is to be installed.

5.2.28. When the tank has been backfilled to subgrade (but before placement of reinforced concrete or asphalt), take the last required tank diameter measurement. Record it as Measurement #4 and determine whether tank deflection is within the allowable limits *shown in TABLE 11-1.*

5.2.28.1. Subtract Measurement #4 from Measurement #1 and record it as the Deflection Measurement on the Tank Installation Checklist.

5.2.29. Install reinforced concrete or asphalt, if used, at this time. *See SECTION 7.4.*

5.2.29.1. The cover depth must meet the appropriate minimum *specified in SECTION 7.4.*

5.2.29.2. For installations in traffic conditions, all secondary backfill used as subgrade backfill must be compacted with a hand-guided, vibrating-plate, mechanical compactor.

5.2.30. If the tank has a monitoring system, after backfilling is completed and after top slab is in place (if used), perform necessary monitoring checks. *See SECTION 15.*

5.2.31. Complete the Tank Installation Checklist.

5.3. WET-HOLE INSTALLATION

5.3.1. *Follow the dry-hole installation instructions (SECTION 5.2.)* with the modifications listed below.

5.3.2. *Perform POINTS 5.2.1. through 5.2.4.4.* of the dry-hole installation instructions.

5.3.3. *Before performing POINT 5.2.5.* of the dry-hole installation instructions, pump water from the excavation hole and continue pumping to maintain minimum water level during tank installation.

5.3.3.1. Attempt to maintain the water level below the top of the bedding materials until the tank can be fully backfilled and ballasted.

5.3.4. *Proceed with POINTS 5.2.5. through 5.2.9.1.* of the dry-hole installation instructions.

5.3.4.1. In high-water conditions, when Xerxes' preferred Man-Out-of-Hole (MOH) anchoring method is not available or possible, *see SECTION 8.8.* for an alternate method.

5.3.5. *Proceed with POINTS 5.2.10. through 5.2.12.3.2.* of the dry-hole installation instructions.

5.3.6. In high-water conditions, where it is not possible to maintain the water level below the top of the bedding material during the entire installation, partially ballast the tank to firmly seat the tank into the bedding material and to keep it from floating. *See SECTION 12* for instructions.

5.3.7. The ballast level in the tank must either be lower than the backfill material or less than 12 inches above the water level in the hole. *See FIGURE 5-2.*

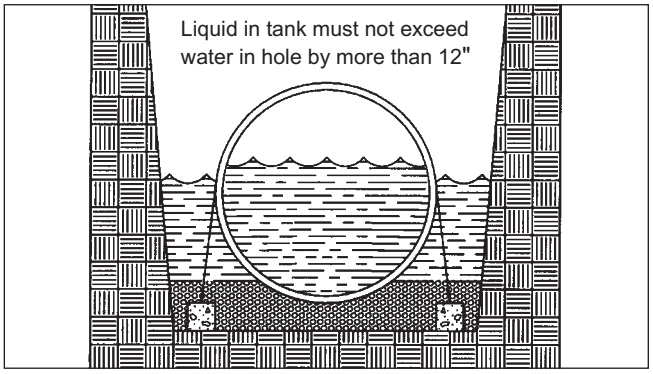


FIGURE 5-2

5.3.8. *Proceed with POINTS 5.2.13. through 5.2.23.* of the dry-hole installation instructions.

5.3.9. Ballast the tank once the backfill is even with the top of the tank. *See SECTION 12.*

5.3.10. *Proceed with POINTS 5.2.25. through 5.2.31.* of the dry-hole installation instructions.

6. BACKFILL MATERIAL

6.1. GENERAL

6.1.1. Xerxes tanks shall be installed using select rounded stones or crushed stones as primary backfill material. *See SECTION 6.2.* for definition of primary backfill material.

6.1.2. Alternatively, Xerxes tanks shall be installed using primary backfill vertically up to at least 75 percent of the tank diameter and secondary backfill above the primary backfill. *See SECTION 6.3.* for definition of secondary backfill and *Xerxes Split Backfill Instructions, APPENDIX C,* for more information regarding this alternative.

6.1.3. Using backfill material other than that *specified in POINTS 6.1.1. and 6.1.2.* without prior written authorization from Xerxes will void Xerxes' obligations under the limited warranty.

CAUTION

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

6.2. PRIMARY BACKFILL

6.2.1. Primary backfill material must meet the following specifications:

6.2.1.1. Material is to be clean, free-flowing, and free of dirt, sand, large rocks, roots, organic materials, debris, ice and snow. Backfill material shall not be frozen or contain lumps of frozen material at any time during placement.

6.2.1.2. An important characteristic of good backfill material is hardness or stability when exposed to water or loads. Most materials have no problem 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.

6.2.1.3. When using select rounded stones, they must conform to the specifications of ASTM C 33, size numbers 6, 67 or 7. *See FIGURE 6-1 and Xerxes Primary Backfill Requirements, APPENDIX B,* for additional information on backfill material specifications.

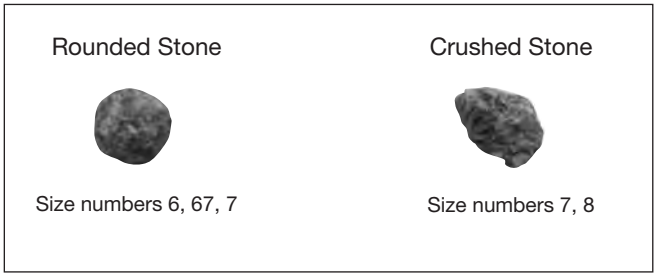


FIGURE 6-1

6.2.1.4. When using select crushed stones, they must conform to the specifications of ASTM C 33, size numbers 7 or 8. *See FIGURE 6-1 and Xerxes Primary Backfill Requirements, APPENDIX B,* for additional information on backfill material specifications.

6.2.2. Xerxes recommends that the supplier of backfill material provides written certification that the material conforms to ASTM C 33, ASTM D 448, AASHTO M 43, and any other applicable specifications.

6.2.3. If primary backfill material which meets these specifications is not available, contact technical support at Xerxes Minneapolis, MN, for information on alternate materials, installation instructions for alternate materials and the process for approval.

6.3. SECONDARY BACKFILL

6.3.1. Material is to be clean, free-flowing, and free of large rocks, roots, organic materials, debris, ice and snow. Backfill material shall not be frozen or contain lumps of frozen material at any time during installation.

6.3.2. Material must be compacted to achieve a minimum of 85 percent standard proctor density.

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

6.3.3. Material must be installed in 12-inch to 24-inch lifts compatible with the compaction equipment used.

6.3.4. In some conditions, frost heave may be encountered when using secondary backfill. Therefore, consider any frost-related problems that may occur.

6.3.5. Specifications for secondary backfill material and compaction above the filter-fabric layer may be determined by the requirements of the piping, surface slab or roadway.

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

6.3.7. The following are examples of acceptable secondary backfill material:

6.3.7.1. clean native backfill

6.3.7.2. coarse sand or gravel.

6.3.8. One hundred percent (100%) of all backfill material must pass through a 1-inch sieve.

6.3.9. Install a layer of geotextile filter fabric over the entire surface of primary backfill material before secondary backfill is placed. *See SECTION 9* for information regarding geotextile fabric.

6.3.9.1. All joints in the filter fabric must be overlapped a minimum of 12 inches.

6.3.9.2. Geotextile fabric must overlap onto the tank and excavation surface a minimum of 12 inches.

6.3.10. *See Xerxes Split Backfill Instructions, APPENDIX C,* for more information regarding this alternative.

7. EXCAVATION REQUIREMENTS

⚠ WARNING

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

7.1. GENERAL

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

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

7.1.1.2. Secure the walls of the excavation.

7.1.1.3. Prevent exposure to hazardous fumes from the excavation.

7.1.1.4. Avoid hazards associated with water accumulation in the excavation.

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

7.1.1.6. Inspect, a minimum of once a day, the excavation and surrounding area during the entire installation process.

7.1.2. 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."

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

7.1.3.1. Additional clearances may be necessary due to federal, state or local regulations, safety requirements or operational requirements. Follow all applicable regulations and safety practices.

7.1.3.2. For additional requirements and specifications, consult all applicable federal, state and local codes and regulations. *See SECTION 1* for additional information.

7.2. EXCAVATION AND TANK LOCATION

7.2.1. 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).

CAUTION

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

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

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

7.2.3.1. the number of tanks to be installed

7.2.3.2. the size of the tanks to be installed.

7.2.4. The location of a tank can be affected by the location of nearby structures. When selecting a tank site, care must be taken to avoid undermining the foundations of existing structures or new buildings to be constructed. *See FIGURE 7-1.*

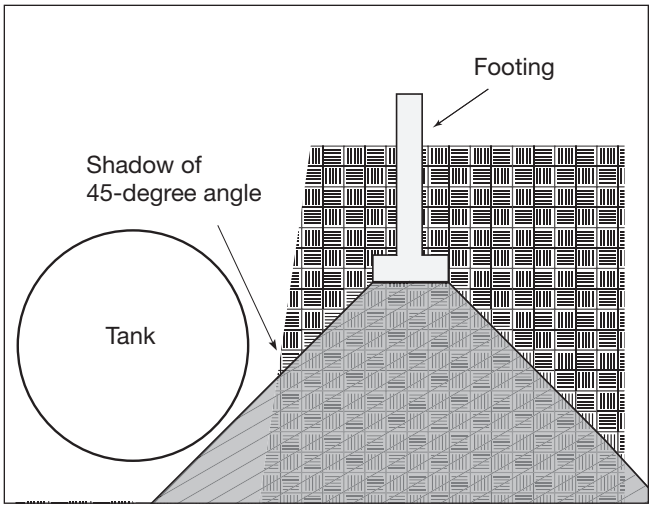


FIGURE 7-1

7.2.4.1. 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.

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

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

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

7.2.5.3. 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.

7.2.5.4. The tank must not fall within the “shadow” of the 45-degree-angle line drawn from the foundation’s footing. *See FIGURE 7-1.*

7.2.5.5. If the tank would fall within this “shadow,” do one of the following to ensure that the tank does not fall within the “shadow”:

7.2.5.5.1. Move the tank away from the existing building.

7.2.5.5.2. Move the foundation of the building to be constructed away from the tank.

7.2.5.5.3. Deepen the footing of the planned building’s foundation.

7.3. DEPTH OF EXCAVATION

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

7.3.1.1. groundwater conditions

7.3.1.2. traffic at the site

7.3.1.3. soft or uneven excavation base

7.3.1.4. codes and regulations.

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

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

7.3.4. Excavations must allow for 12 inches of backfill between the bottom of the tank and the bottom of the excavation or the top of the anchor slab (or any other stabilizing materials used). *See POINT 7.5.3.3. and SECTION 8.6.*

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

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

7.4. DEPTH OF COVER

⚠ CAUTION

In both traffic and nontraffic installations, no truck or equipment loads are allowed over the tank until the backfill is at the minimum specified requirements. Failure to follow this caution may result in minor or moderate injury, and/or damage to the tank.

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

CAUTION

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

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

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

7.4.3.1. Additional depths of cover may be necessary due to federal, state or local regulations, safety requirements or operational requirements.

⚠ WARNING

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

7.4.4. Tanks not subjected to traffic must have a cover depth of 12 inches of backfill. *See TABLE 7-1.*

7.4.5. Tanks subjected to traffic must have a cover depth of one of the following:

7.4.5.1. 36 inches of backfill

7.4.5.2. 18 inches of backfill and 6 inches of reinforced concrete

7.4.5.3. 18 inches of backfill and 8 inches of asphalt.

7.4.6. *See TABLE 7-1* for minimum requirements for tanks other than petroleum tanks.

Depth of Cover
Minimum Requirements for Tanks Other than Petroleum Tanks

No Traffic
- 12" backfill

Traffic Options
- 36" backfill
- 18" backfill + 6" reinforced concrete
- 18" backfill + 8" asphalt

NOTE: The maximum burial depth for standard tanks is 7 feet of cover over the top of the tank.

TABLE 7-1

7.4.7. Tank owner must follow NFPA 30 and 31, as a minimum, for petroleum tanks. See TABLE 7-2 for those requirements.

Depth of Cover
Minimum Requirements for Petroleum Tanks

No Traffic Options
- 24" backfill
- 12" backfill + 4" reinforced concrete
- 12" backfill + 6" asphalt

Traffic Options
- 36" backfill
- 18" backfill + 6" reinforced concrete
- 18" backfill + 8" asphalt

NOTE: These are NFPA 30 and 31 requirements.

TABLE 7-2

7.4.8. The maximum burial depth for standard tanks is 7 feet of cover over the top of the tank. However, tanks can be designed for a deeper burial.

7.4.8.1. Call your Xerxes representative for a special quotation prior to tank purchase if the burial depth is to be greater than 7 feet.

7.4.8.2. If you are installing a tank and need to consider a deeper burial than that given for the tank that was ordered, contact your Xerxes representative to discuss available options.

7.4.8.3. Prior written authorization from Xerxes is required to deviate from a standard tank's maximum burial depth.

7.4.9. Surface asphalt and concrete pads must extend a minimum of 12 inches beyond the tank in all directions.

7.4.10. If there is an unattached 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.

7.4.11. Traffic loads from the top slab must not be transmitted to a containment sump or a riser. A minimum space of 3 inches must exist between the riser or sump and the slab. *See SECTION 16.*

7.5. TANK SPACING

7.5.1. GENERAL

7.5.1.1. The following are minimum spacings and must be increased as needed to accommodate deadmen or anchor slabs. *See SECTION 8.*

7.5.1.2. Always provide sufficient clearance to allow the deadmen to be set outside of the tank "shadow." *See FIGURE 7-2.*

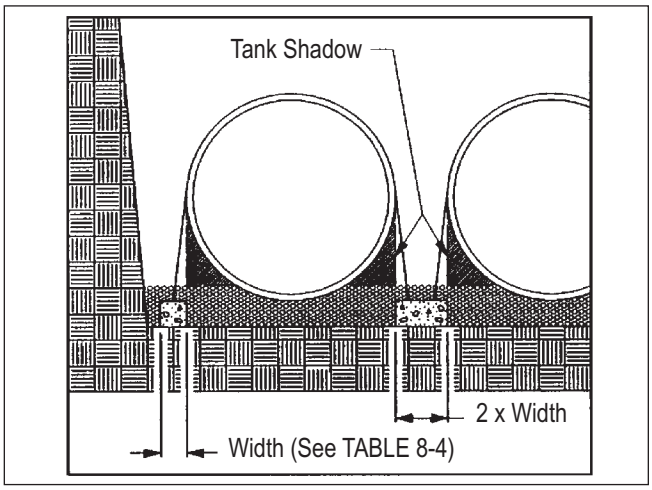


FIGURE 7-2

7.5.2. SPACING IN STABLE IN SITU (NATIVE) SOIL CONDITIONS

7.5.2.1. The minimum spacing between the sidewall or endcap of the tank and the side of the excavation must be 18 inches. *See FIGURE 7-3.*

NOTE: All measurements from the tank sidewalls are to be taken from the outside diameter of the tank ribs.

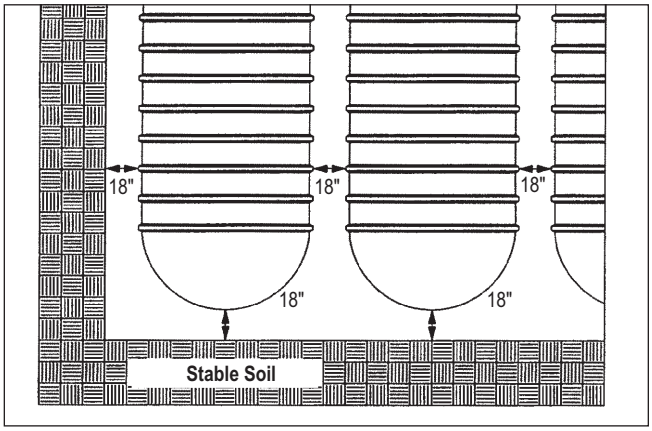


FIGURE 7-3

7.5.2.2. If two or more tanks are installed in the same hole, allow for at least 18 inches between the tanks. *See FIGURE 7-3.*

7.5.2.3. If two or more tanks are installed in the same hole and deadmen are used, the space between the tanks must be equal to or greater than two times the width of the deadman or deadmen required between the tanks. *See FIGURE 7-2 and TABLE 8-4.*

7.5.2.3.1. For instance, the space between tanks using deadmen is typically 24 inches for tanks up to and including 8-foot-diameter tanks, 36 inches for 10-foot-diameter tanks, and 72 inches for 12-foot-diameter tanks.

7.5.3. SPACING IN UNSTABLE IN SITU (NATIVE SOIL) CONDITIONS

7.5.3.1. 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, soft or highly expansive clay, underground stream, etc.).

7.5.3.2. 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 one-half (1/2) 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 7-4.*

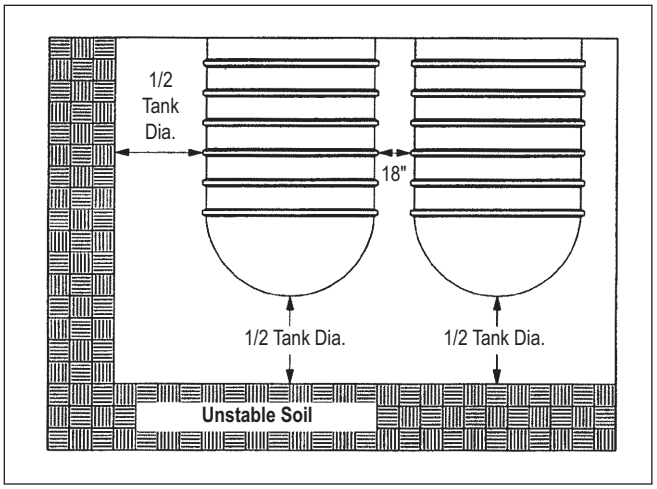


FIGURE 7-4

7.5.3.3. Stabilizing materials, such as a reinforced concrete slab, may be required under the tank as a foundation in addition to the required 12-inch bedding in an excavation where the bottom is unstable.

7.5.3.4. The spacing between adjacent tanks is to be at least 18 inches. *See FIGURE 7-4.*

7.5.3.5. If deadmen are used, follow the spacing requirements between the tanks *given in POINTS 7.5.2.3. and 7.5.2.3.1.*

8. ANCHORING SYSTEMS

8.1. GENERAL

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

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

CAUTION

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

8.2. ANCHOR STRAPS

8.2.1. GENERAL

8.2.1.1. Only Xerxes anchor straps may be used when anchoring a Xerxes tank.

8.2.1.2. Xerxes has two anchor strap models (not including man-out-of-hole straps)—D-ring/hook anchor straps and D-ring/D-ring anchor straps.

8.2.1.2.1. Depending on which type of anchor strap is being used, *see either SECTION 8.2.2. or 8.2.3.*

8.2.1.3. The locations for anchor straps on each tank are marked on the tank ribs by the arrowhead symbols ▶◀ (on the tank itself on 4-foot-diameter tanks).

8.2.2. D-RING/HOOK ANCHOR STRAPS

8.2.2.1. When installing any size tank, and when using Xerxes' D-ring/hook anchor straps and Xerxes' prefabricated deadmen, the deadmen are to be placed so that the top of the deadmen is even with the bottom of the tank. *See FIGURE 8-1 and TABLE 8-1* for anchor-point dimensions.

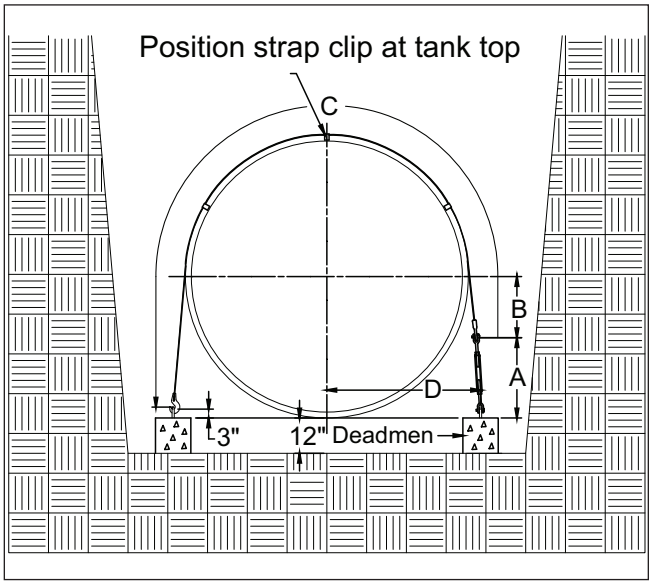


FIGURE 8-1

Anchoring Dimensions for FIGURE 8-1					
Tank Dia.	A	B	C	D min.	D max.
4'	18"	13"	9'-8"	27"	30"
6'	26"	10"	13'-5"	42"	48"
8'	26"	20"	17'-10"	52"	58"
10'	26"	34"	23'-9"	69"	75"
12'	26"	43"	27'-9"	87"	93"

TABLE 8-1

8.2.3. D-RING/D-RING ANCHOR STRAPS

8.2.3.1. When installing any size tank, and when using Xerxes' D-ring/D-ring anchor straps and Xerxes' prefabricated deadmen, the deadmen are to be placed so that the top of the deadmen is even with the bottom of the tank. *See FIGURE 8-2 and TABLE 8-2* for anchor-point dimensions.

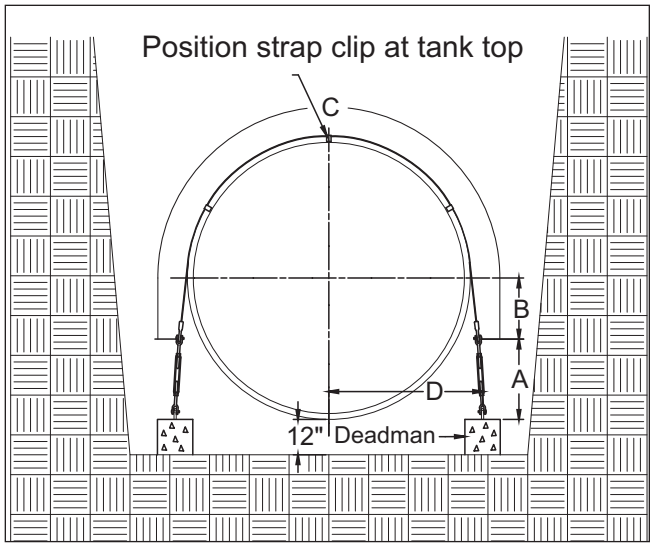


FIGURE 8-2

Anchoring Dimensions for FIGURE 8-2					
Tank Dia.	A	B	C	D min.	D max.
4'	18"	12"	8'-4 1/4"	27"	30"
6'	23"	13"	12'-1"	42"	48"
8'	31"	15"	15'-1"	52"	58"
10'	45"	15"	18'-8 3/4"	69"	75"
12'	50"	23"	22'-6 3/4"	87"	93"

TABLE 8-2

8.3. HARDWARE AND ANCHOR POINTS

8.3.1. When Xerxes-supplied anchoring hardware is not being used, the installing contractor is responsible for providing hardware and anchor points of sufficient size and strength for the tank being installed.

8.3.2. Anchoring hardware must be manufactured to industry standards and dimensions, and sized *according to TABLE 8-3.*

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 8-3

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

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

8.3.4. If hardware being used is not provided by Xerxes, contact the hardware manufacturer or supplier for specific information on hardware and its use.

8.3.5. Locate the anchor points *as shown in FIGURE 8-1 or 8-2 (whichever is applicable) and TABLE 8-1 or 8-2 (whichever is applicable). Refer to dimension "D" in TABLE 8-1 or TABLE 8-2*. Align (within a tolerance of ±1 inch) all anchor points with the marked arrowhead symbols ▶◀ on the tanks.

8.3.6. Use only appropriately sized hardware with the strap eye. *See FIGURE 8-3 for dimensions of strap eye.*

⚠ CAUTION

Oversized hardware may damage the strap eye and may result in minor or moderate injury.

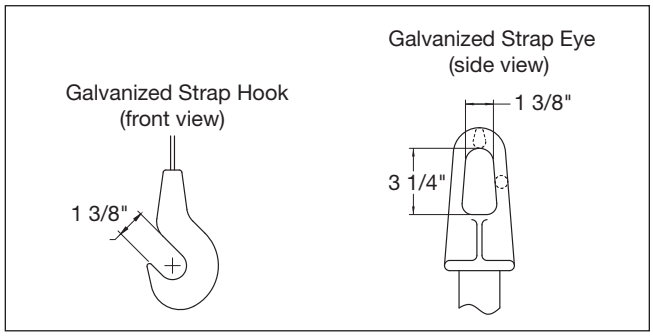


FIGURE 8-3

8.3.7. When connecting the end of an anchor strap to the anchor point, common methods are those *shown in FIGURE 8-4:* A) using a drop-forged turnbuckle, B) using a looped wire rope, C) using a combination of both A and B, and D) using the hook end of the strap.

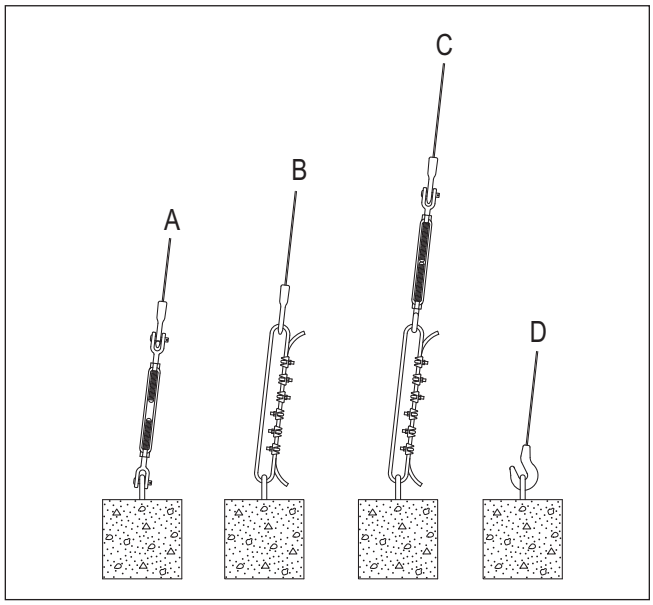


FIGURE 8-4

8.3.8. If using a 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 8-4, FIGURE 8-5 and FIGURE 8-6.*

8.3.8.1. The installer is responsible for using appropriate and approved engineering practices when fastening wire rope.

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

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

8.3.11. 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 8-5.*

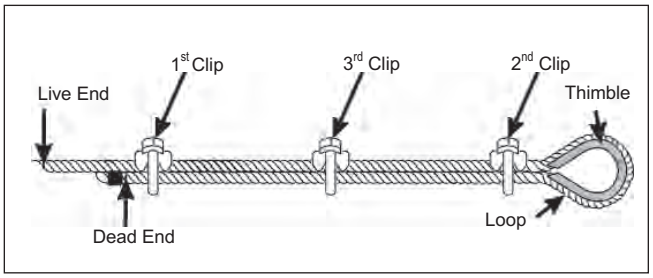


FIGURE 8-5

8.3.12. For each clip, apply a U-bolt over the dead end of the wire rope. *See FIGURE 8-5.*

NOTE: Live end rests in the saddle.

8.3.13. When only 2 clips are required, apply the second clip as close to the loop or thimble as possible. *See FIGURE 8-5.*

8.3.14. When more than 2 clips are required, apply the second clip as close to the loop or thimble as possible, turn nuts on the second clip firmly, but do not tighten initially. *See FIGURE 8-5.*

8.3.15. When more than 2 clips are required, space additional clips equally between the first 2, take up rope slack and tighten nuts on each U-bolt evenly.

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

8.3.17. If forming a loop in the wire rope, a splice is required for connecting the two ends together.

8.3.17.1. Standard rigging practice for splicing wire rope calls for using twice the number of clips recommended for a single-end termination.

8.3.17.2. Use a minimum of 4 clips for a 3/8-inch wire rope and a minimum of 6 clips for a 1/2-inch wire rope.

8.3.17.3. Place the rope ends parallel to each other and install the clips *as shown in FIGURE 8-6.*

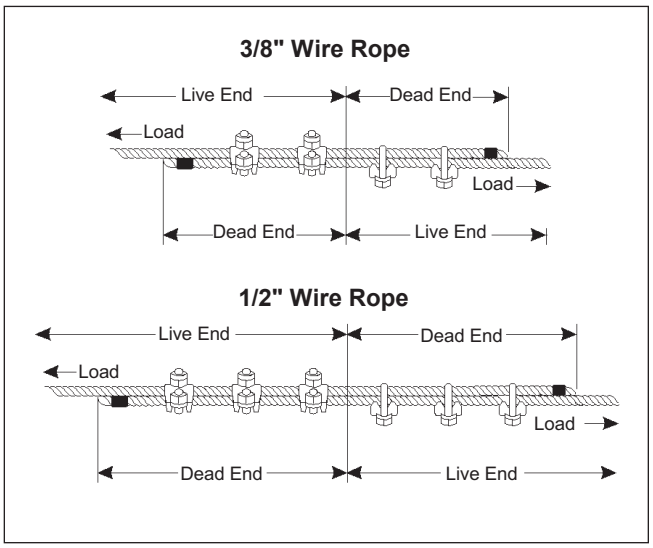


FIGURE 8-6

8.4. DEADMEN

8.4.1. A deadman is typically a reinforced concrete beam and should be designed according to the applicable American Concrete Institute code.

8.4.2. The length of a deadman is typically equal to the length of the tank.

8.4.3. Deadmen may be installed in multiple sections as long as the total length of the assembled deadman is appropriate for the installed tank, and as long as each section contains at least two balanced anchor points.

8.4.4. The width and thickness of a deadman depends on the tank diameter, water-table height, number of containment sumps and burial depth.

8.4.5. *See TABLE 8-4* for typical deadmen dimensions for Xerxes tanks (other than 10-foot-diameter tanks with a capacity greater than 25,000 gallons), given the following scenario: an empty tank, a 3-foot burial depth, groundwater to grade, and one containment sump.

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

TABLE 8-4

8.4.5.1. If tanks are installed with any conditions different from *those identified in POINT 8.4.5*, and/or if tanks are 10-foot-diameter tanks with a capacity greater than 25,000 gallons, the installation may require either a deeper burial or deadmen larger than *those shown in TABLE 8-4.* Contact technical support at Xerxes Minneapolis, MN, for further information.

8.4.6. Lay the deadmen in the excavation parallel to the tank and outside of the tank "shadow." *See FIGURE 7-2.*

8.4.7. In installations where two or more tanks are installed using deadmen:

8.4.7.1. a separate anchor point must be provided for each anchor strap

8.4.7.2. the minimum spacing between the tanks must be equal to or greater than the width of the deadman used for the tanks

8.4.7.3. each tank will have its own set of deadmen, however, one deadman may be used between two tanks if the deadman is double the width of the single deadman *specified for tanks in SECTION 7.*

8.5. XERXES PREFABRICATED DEADMEN

8.5.1. 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.

8.5.2. For placement of Xerxes prefabricated deadmen, *see FIGURE 8-1 or 8-2 (whichever is applicable) and the Xerxes supplement, Prefabricated Deadmen Installation Instructions.*

8.5.3. Xerxes prefabricated deadmen are supplied with 3/4-inch-diameter, galvanized, adjustable 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 guide ropes to guide the deadmen when lifting. Failure to do so could result in death or serious injury.

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

8.5.5. The anchor points can be moved and positioned to match the anchor strap locations marked by arrowhead symbols ▶◀ on the tank rib (on the tank itself for 4-foot-diameter tanks).

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

8.5.7. Keep backfill from entering the anchor-point slot until final adjustment is made.

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

8.6. ANCHOR SLABS

8.6.1. An anchor slab is a reinforced concrete base and should be designed according to the applicable American Concrete Institute.

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

8.6.3. The minimum slab thickness is 8 inches.

8.6.4. 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.

8.6.5. Provide a separate anchor point for each anchor strap.

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

8.6.7. *Refer to FIGURE 8-7* for anchor-point height. *Refer to TABLE 8-1 or TABLE 8-2* for other anchor-point dimensions.

8.6.8. 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 8-7.*

8.6.9. Anchor points must extend 3 inches above the bedding. With a 12-inch bedding, the anchor point is 15 inches above the slab.

NOTE: If a turnbuckle is used with a 4-foot-diameter tank, the anchor point must be 3 inches below the top of the bedding.

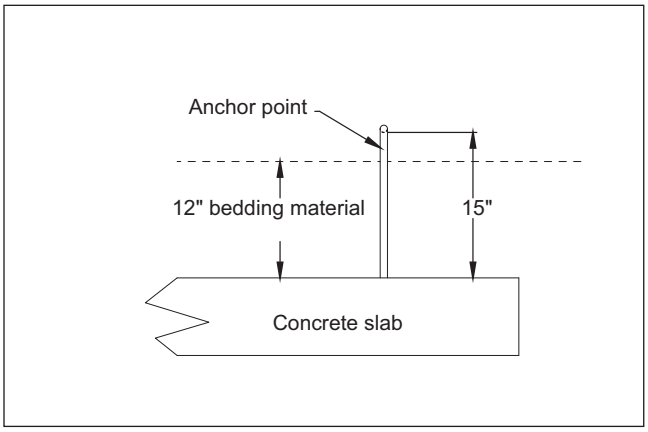


FIGURE 8-7

8.7. MAN-OUT-OF-HOLE (MOH) STRAPS

8.7.1. The Xerxes man-out-of-hole (MOH) strap system is designed for use in installations where water is in the excavation and/or where personnel may not enter the tank hole.

8.7.1.1. This strap system can be, but need not be, used in conjunction with Xerxes deadmen.

8.7.2. When using the MOH strap system, the placement of components is critical. *See the Xerxes supplement, Man-Out-of-Hole (MOH) Straps Instructions.*

8.8. ALTERNATE WET-HOLE ANCHORING METHOD

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

8.8.1.1. Place the anchor strap between the wire rope and the tank so that the wire rope is never in direct contact with the tank.

8.8.1.1.1. The H-shaped positioning clips around the strap are designed to accommodate the wire rope on top of the strap *as shown in FIGURE 8-8.*

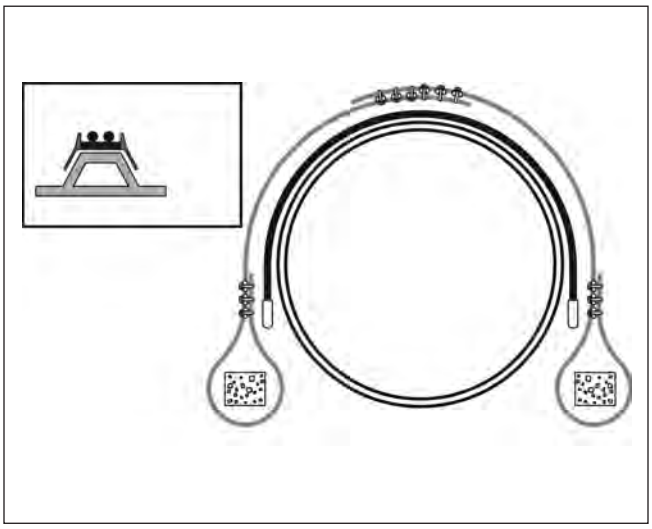


FIGURE 8-8

8.8.1.2. Loop a wire rope around the deadman at each rib marked with an arrowhead symbol ▶◀ (at each marked location on 4-foot-diameter tanks).

8.8.1.3. Secure the termination of the wire rope.

8.8.1.4. Lower each deadman to the bottom of the excavation using the wire rope.

8.8.1.5. Center each anchor strap on each location marked with an arrowhead symbol ▶◀.

8.8.1.6. Bring the live end of each wire rope up to the top of the tank at each marked location.

8.8.1.7. Take the slack out of each wire rope and splice the termination of the wire ropes on top of the tank.

9. GEOTEXTILE FABRIC

9.1. GENERAL

9.1.1. Geotextile fabric allows the passage of water in and out of the excavation but prevents the migration and mixing of in situ soil and the select backfill material. Geotextile helps preserve the integrity of the select backfill envelope that surrounds and supports the tank.

9.1.2. 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.

9.1.3. Using geotextile fabric is considered good installation practice and Xerxes recommends using it in any installation, but especially when the tank is installed in the following conditions:

9.1.3.1. areas with frequently changing groundwater conditions or areas subject to tidal fluctuations

9.1.3.2. unstable soils, such as those *cited in SECTION 7.5.3.*

9.1.3.3. water conditions with silty in situ soil.

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

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

10. BOTTOM SUMPS AND FITTINGS

10.1. GENERAL

10.1.1. 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.

10.1.2. When installing a large bottom sump in a water or wastewater tank, *see the Xerxes supplement, Large Bottom Sump Installation Instructions. See SECTION 20* for details on where to obtain this supplement.

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 result in damage to the tank and/or surrounding property.

10.1.3. While preparing the backfill bedding, dig a hole in the bottom of the excavation that is large enough to accommodate the sump or fitting. *See FIGURE 10-1.*

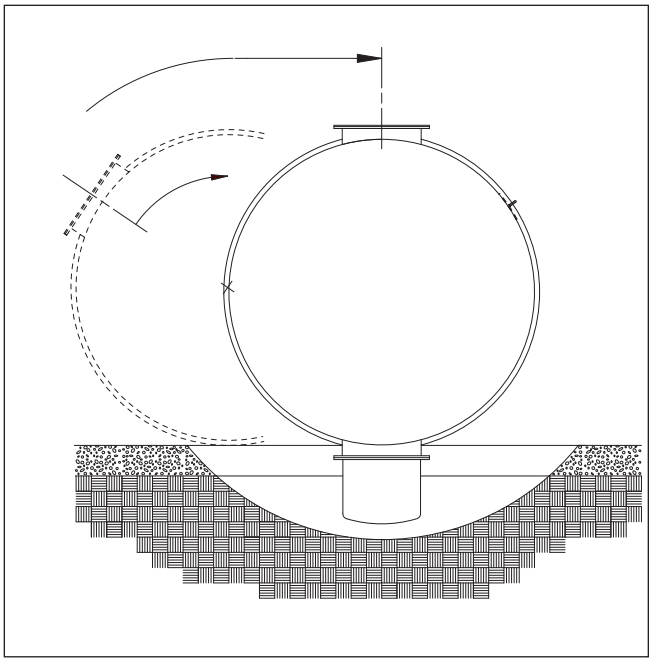


FIGURE 10-1

10.1.4. The required 12 inches of backfill bedding on the bottom of the excavation must also be present in the excavation hole in which the sump or fitting will be placed. *See FIGURE 10-2.*

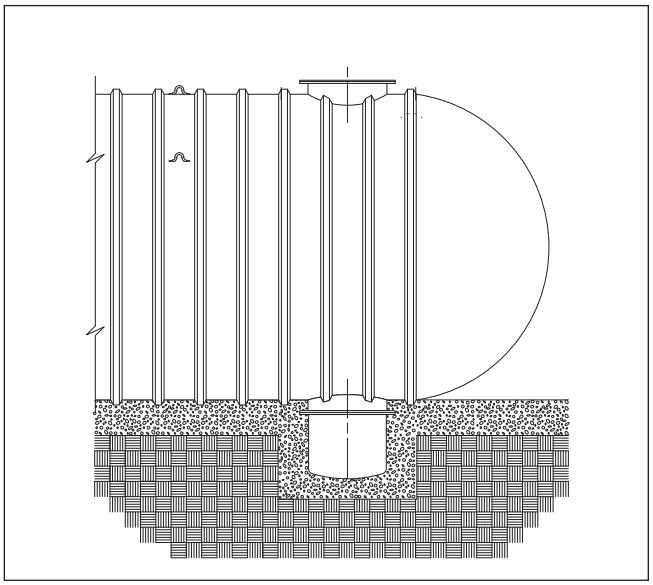


FIGURE 10-2

10.1.5. After setting the tank, fill and tamp the space around the sump or fitting by using hand tools before continuing the backfilling.

11. TAKING DIAMETER MEASUREMENTS

11.1. GENERAL

11.1.1. Diameter measurements must be taken at various stages of the installation process to verify that the process is proceeding correctly.

11.1.1.1. It is important that these measurements are taken and, if needed, appropriate action is taken so that tank deflection is within allowable limits.

11.1.2. Diameter measurements of the tank must be taken at one or more locations on each tank or tank compartment. It is preferable to take the deflection measurement near the center of a tank or compartment if possible.

11.1.3. An initial measurement must be taken before installation of the tank begins. This first measurement is used as a comparison reference for subsequent measurements in order to check proper backfill placement.

11.1.4. Additional measurements must be taken: a) after applying anchor straps (if used), b) after backfilling is brought to the top of the tank, c) after backfilling is brought to subgrade and before placement of reinforced concrete or asphalt (if used).

11.1.5. Measure the distance from the bottom edge of a tank fitting to the bottom of the tank immediately below that fitting.

11.1.6. Described here are two methods using a dipstick to measure the internal diameter of the tank—one not using a standpipe and one using a standpipe.

11.1.6.1. Similar methods can be used, such as using a tape measure, for example.

11.1.7. The deflection measurement can be obtained by using the same method twice or by using each method once.

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

11.2. DIAMETER MEASUREMENT WITHOUT A STANDPIPE

11.2.1. Place the dipstick into a service fitting.

11.2.2. Measure the distance from the tank bottom to the top of the fitting and record this measurement.

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

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

11.2.5. Subtract the second measurement (inside tank top to top of fitting) from the first measurement (tank bottom to top of fitting).

11.2.6. Record the measurement at the appropriate place (as Measurement #1, #2, #3 or #4) *on the Tank Installation Checklist*.

11.3. DIAMETER MEASUREMENT WITH A STANDPIPE

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

11.3.2. Measure the distance from the tank bottom to the top of the standpipe and record this measurement.

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

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

11.3.5. Subtract the second measurement (inside tank top to top of standpipe) from the first measurement (tank bottom to top of standpipe).

11.3.6. Record the measurement at the appropriate place (as Measurement #1, #2, #3 or #4) *on the Tank Installation Checklist*.

11.4. CALCULATION AND COMPARISON

11.4.1. To get the deflection measurement at any time during installation, take a diameter measurement and subtract it from Measurement #1.

11.4.2. Compare this measurement to the applicable allowable deflection *shown in TABLE 11-1.*

Tank Diameter	Allowable Deflection
4'	1/2"
6'	3/4"
8'	1 1/8"
10'	1 1/2"
12'	1 3/4"

TABLE 11-1

11.4.3. Vertical deflection in excess of this measurement indicates improper installation.

12. BALLASTING TANKS (ADDING LIQUID)

⚠ WARNING

Inert the tank and use inert gases (not air) to pressure test a tank that contains or has contained flammable or combustible liquids or vapors. Failure to follow this warning could result in an explosion, and could result in death or serious injury.

⚠ WARNING

If flammable or combustible product is used as ballast, exercise special care in handling. Safeguard against sparks, fire or product spills. Failure to follow this warning could result in a fire or an explosion, and could result in death or serious injury.

⚠ WARNING

The tank must 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 could 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 at least 75 percent of the way up 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 75 percent of the way up the tank. *See SECTION 5.3.*

12.1.3. Care must be taken so that the use of ballast does not contaminate the product being stored. This is especially important for potable water, chemical and diesel exhaust fluid (DEF) tanks.

12.1.3.1. Contamination can be avoided by doing one of the following:

12.1.3.1.1. ballast the tank with a liquid compatible with the product being stored, or

12.1.3.1.2. clean the tank after ballasting to eliminate any contaminating product.

13. POSTINSTALLATION TESTING

⚠ WARNING

Inert the tank and use inert gases (not air) to pressure test a tank that contains or has contained flammable or combustible liquids or vapors. Failure to follow this warning could result in an explosion, and could result in death or serious injury.

⚠ WARNING

If flammable or combustible product is used as ballast, exercise special care in handling. Safeguard against sparks, fire or product spills. Failure to follow this warning could result in a fire or an explosion, and could result in death or serious injury.

13.1. GENERAL

13.1.1. After backfill is brought close to the top of the tank, take a diameter measurement.

13.1.2. Typically, tanks should be air tested before ballasting.

13.1.2.1. Do not use atmospheric air when testing air-testable tanks that have held product. Use nitrogen or other inert gas when testing these tanks.

13.2. AIR TESTING TANKS

13.2.1. If the tank is a wastewater tank equipped for air testing, *follow the procedures in the Xerxes supplement, Preinstallation Testing Instructions for Water/Wastewater Tanks Factory-Equipped for Pressure Testing. See SECTION 20* for information on how to obtain this supplement.

13.2.2. All UL-labeled tanks, chemical tanks and potable water tanks must be air tested after backfill is brought close to the top of the tank.

13.2.3. To air test a tank, pressurize the primary tank to 5 psig (3 psig for 12-foot-diameter tanks) using a test manifold (see FIGURE 3-2).

13.2.3.1. Soap all service fittings and manways on the top of the tank.

13.2.4. If the interstitial space of the tank is filled with monitoring fluid, check the fluid level and check that there is no monitoring fluid in the interior of all tank compartments.

13.2.5. If the interstitial space of the tank was shipped under vacuum and the factory-supplied vacuum has not been released, check that the vacuum gauge shipped with the tank reads 12 inches of mercury or more.

13.2.5.1. If the vacuum gauge reads less than 12 inches of mercury, contact the plant from which the tank was shipped.

13.2.6. If the tank is a dry-monitor, double-wall tank with the interstice not under vacuum, bleed pressure from the primary tank to the interstice.

13.2.7. Hold and monitor the pressure in the interstitial space for a minimum of 1 hour. If pressure drops in the interstice more than 1 psig, contact the plant from which the tank was shipped.

13.2.8. Carefully release the air pressure from the tank.

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

13.2.10. If the air test was not successful, contact the plant from which the tank was shipped.

13.3. OPTIONAL HYDROSTATIC TESTING

13.3.1. This optional test is typically used for water or wastewater tanks that are not air-testable due to the accessories on the tank.

13.3.2. 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 follow this caution may result in damage to the tank and/or surrounding property.

13.3.3. Seal off the influent and effluent piping, and any fittings that are below the tank top with watertight caps or plugs.

13.3.4. Fill the tank with water to a level that is 3 inches into the access openings after the hole is backfilled at least 75 percent of the way up the tank.

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

13.3.6. If the water level drops, check to see that plugs or caps sealing off the piping are tight. Then add more water to fill air voids and return the water level back to the standard testing level. *See Point 13.3.3.*

13.3.7. If the water level does not stabilize, contact the plant from which the tank was shipped.

14. PIPING AND VENTING

14.1. INTERNAL PIPING

14.1.1. All piping must conform to all applicable codes and standards.

CAUTION

All internal piping must be at least 4 inches from the tank bottom. Failure to follow this caution may result in damage to the tank and/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, the tank and/or surrounding property.

14.1.2. For tanks equipped with manways, *refer to FIGURE 14-1 along with TABLE 14-1* to determine the correct dimensions for sizing internal piping.

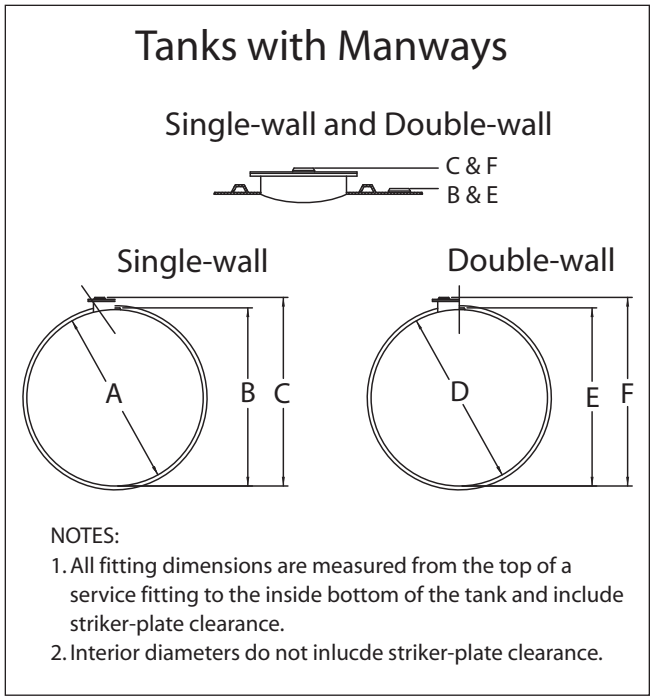


FIGURE 14-1

Dimensions for FIGURE 14-1						
Tank Dia.	A	B	C	D	E	F
4'	48"	49 1/2"	54 1/2"	48"	49 1/2"	54 1/2"
6'	71 3/8"	73"	78"	70 3/4"	72 1/2"	77 3/4"
8'	91 1/4"	93"	98"	90"	91 3/4"	97"
10'	119 1/4"	121"	126"	118"	119 3/4"	125"
12'	136 5/8"	138 1/4"	143 1/4"	---	---	---

TABLE 14-1

14.1.3. For tanks equipped with access openings, *refer to FIGURE 14-2 along with TABLE 14-2* to determine the correct dimensions for sizing internal piping.

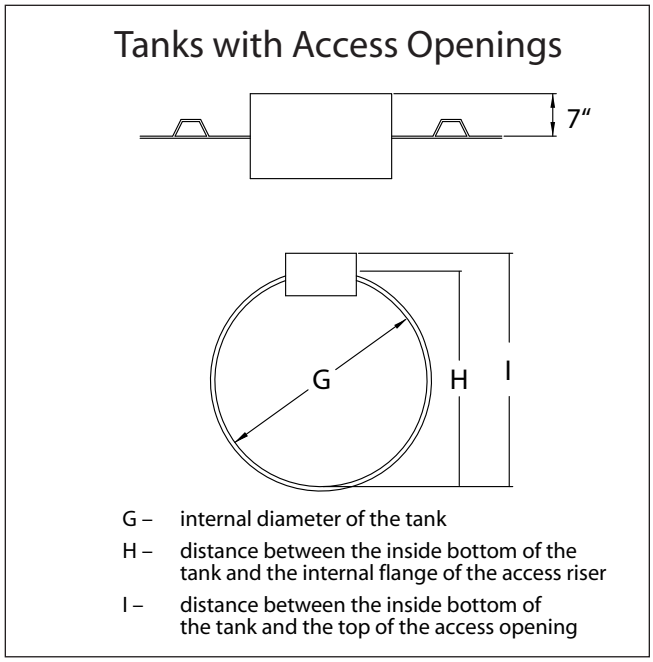


FIGURE 14-2

Dimensions for FIGURE 14-2			
Tank Dia.	G	H	I
4'	48"	51 1/4"	55 1/4"
6'	71 3/8"	74 3/4"	78 3/4"
8'	91 1/4"	94 1/2"	98 1/2"
10'	119 1/4"	122 1/2"	126 1/2"
12'	136 5/8"	140"	144"

TABLE 14-2

14.2. EXTERNAL PIPING

⚠ WARNING

The tank must be isolated from all piping when the external piping is being pressure tested. The test pressures for external piping could cause tank failure, and could 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 result in damage to the tank and/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 result in damage to the tank and/or surrounding property.

14.3. 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 could result in death or serious injury.

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

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

14.3.3. 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.

14.3.4. Whenever installing overfill protection, such as an alarm, an automatic shut-off device (flapper valve) or a vent-restriction device (ball-float valve), 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.

14.3.4.1. Some jurisdictions do not allow ball-float valves. Consult applicable codes and regulations.

⚠ WARNING

Vent-restriction devices for overfill 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 could result in death or serious injury.

14.4. VENTING INTERSTITIAL SPACES

CAUTION

All wet monitoring systems must be vented for proper operation. Failure to do this may result in damage to the tank and/or surrounding property.

14.4.1. 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.

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

15. MONITORING TANKS

15.1. GENERAL

15.1.1. It is the responsibility of the tank owner and/or operator to determine the appropriate monitoring system and method if one is to be used.

15.2. SINGLE-WALL TANK

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

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

15.3. DOUBLE-WALL TANK

15.3.1. GENERAL

15.3.1.1. A 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 detection and containment of product from the primary tank.

15.3.1.2. A double-wall tank, as supplied, will have a minimum of one monitoring access fitting that provides access into the interstitial space.

15.3.1.3. Liquid and vapor sensors are installed through the monitoring access fitting.

15.3.1.3.1. Most sensors can be installed after the tank has been backfilled to grade. However, for ease of installation, the sensor may be inserted into the monitoring access fitting before installing the monitoring riser pipe to grade.

15.3.2. DOUBLE-WALL TANK WITH A DRY INTERSTITIAL SPACE

15.3.2.1. A safe electronic or mechanical monitoring system should be used to detect product and incoming water.

15.3.2.2. The monitoring system should detect product and water at the bottom of the tank.

15.3.2.3. If ordered as an accessory, use the factory-installed drawstring to facilitate positioning of the monitoring sensor at or near the bottom of the tank.

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

15.3.2.5. For liquid or vapor sensors, the monitoring access fitting may be vented to atmosphere (independent from the primary tank) or sealed.

15.3.3. DOUBLE-WALL TANK WITH A WET INTERSTITIAL SPACE

15.3.3.1. A double-wall tank may be shipped with a factory-installed TRUCHEK® monitoring system.

15.3.3.1.1. 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* for more information.

15.3.3.1.2. When a double-wall tank is shipped with the TRUCHEK monitoring system, the interstitial space is typically filled with monitoring fluid at the manufacturing facility.

15.3.3.1.3. Some tanks may be shipped with extra monitoring fluid so the monitoring-fluid level can be topped off.

15.3.3.2. When the tank is delivered and before it is installed, check the monitoring-fluid level and record it *on the shipping/receiving paperwork and Tank Installation Checklist. See FIGURE 15-1.*

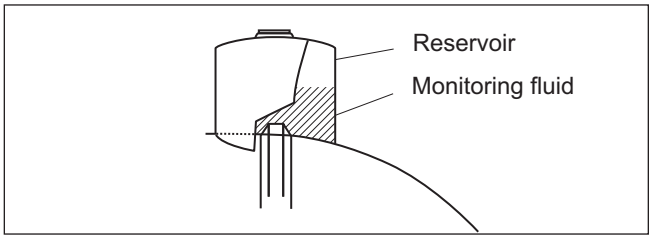


FIGURE 15-1

15.3.3.3. The required operating level for the monitoring fluid is approximately 1/2 full. If necessary, fill to the 1/2 full level with the Xerxes-supplied monitoring fluid shipped with the tank.

NOTE: Do not add monitoring fluid until after tank burial is completed and the monitoring system is set up.

CAUTION

All wet interstitial spaces must be vented to atmosphere. Failure to follow this caution may result in damage to the tank and/or surrounding property. *See SECTION 14.4.*

15.3.3.4. If monitoring fluid is not in the reservoir, contact the Xerxes customer service coordinator.

15.3.3.5. 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. Monitoring fluid in the standpipe may create excessive pressure on the interstitial space and may result in damage to the tank. *See the Xerxes TRUCHEK brochure* for more information.

15.3.3.6. The monitoring-fluid level may fluctuate during shipping and installation.

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

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

15.3.3.8.1. preinstallation air test

15.3.3.8.2. rise in groundwater level

15.3.3.8.3. backfill compaction

15.3.3.8.4. ballasting.

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

15.3.4. SETTING THE LEVEL OF THE MONITORING FLUID

15.3.4.1. 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.

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

15.3.4.2. Once the tank is installed, the level of the monitoring fluid may fluctuate due to such things as:

15.3.4.2.1. product level

15.3.4.2.2. groundwater fluctuation

15.3.4.2.3. tank filling and emptying

15.3.4.2.4. product-temperature variation.

15.3.4.3. 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.

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

15.3.4.3.2. If using something other than a two-sensor probe, use 7 inches from the top of the tank as the starting 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 15-2.***

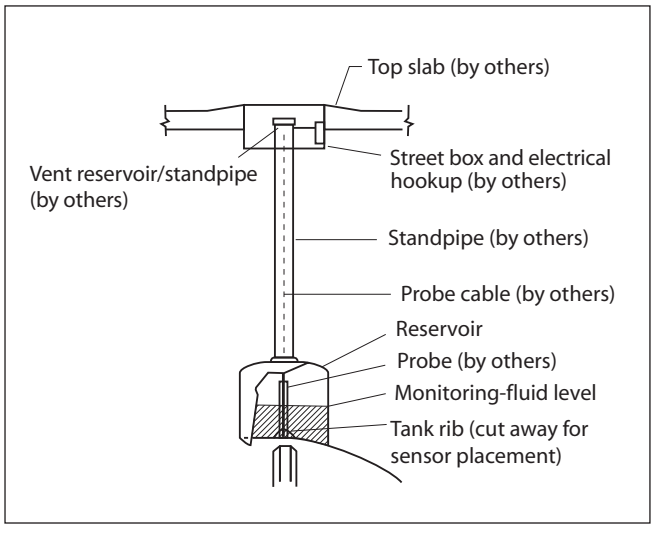


FIGURE 15-2

15.3.4.4. After determining the starting point, adjust the monitoring fluid based on the product level.

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

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

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

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

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

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

16. INSTALLING CONTAINMENT SUMPS

16.1. GENERAL

16.1.1. Xerxes containment sumps come in a variety of models and sizes, including single-wall and double-wall models, and round and flat-sided models.

16.1.1.1. Instructions for the different models are found in Xerxes' supplemental materials. *See SECTION 20* for information on where to obtain supplemental instructions.

16.1.2. The containment sump provides an enclosure for a submersible pump and a termination point for secondary piping systems.

16.1.2.1. It provides containment of product from the pump and/or piping connections.

16.1.2.2. It is designed to be monitored continuously using electronic sensors.

16.1.3. Consult federal, state and local codes and regulations to ensure proper monitoring compliance.

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

16.1.5. Before installing the containment sump, perform a visual inspection of the sump for potential shipping damage.

16.1.6. If damage is detected, contact the plant from which the tank was shipped.

⚠ CAUTION

Always wear eye protection and gloves when handling, grinding, cutting and attaching the containment sump unit. Failure to do so may result in minor or moderate injury.

CAUTION

Do not drop the containment sump assembly components or allow the sump body to roll. Since high winds could damage the sump components, protect and secure all pieces if windy conditions arise. Failure to follow this caution may result in damage to surrounding property.

16.1.7. Measure the sump to ensure it is the correct length for intended burial depth. For further instructions, s*ee the Xerxes supplement applicable for the specific containment sump being installed. See SECTION 20* for list of supplements.

16.2 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 follow this caution may result in property damage.

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

16.2.2. Backfill around the outside edge of the containment sump, making sure that no backfill is on top of the containment sump. *See FIGURE 16-1, Area A.*

16.2.3. Isolate the containment sump from all traffic loads.

16.2.3.1. 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.

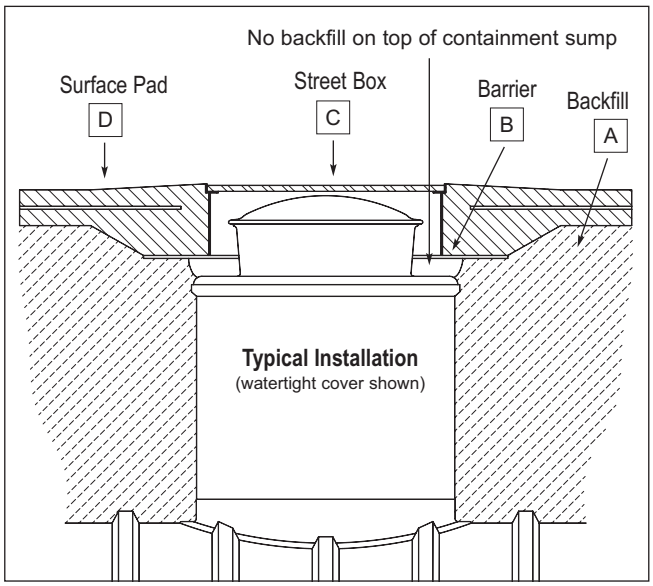


FIGURE 16-1

16.2.3.2. Typically, a sheet of plywood (or other material) is used as a barrier and is set on the backfill to ensure that there is at least a 3-inch clearance above the containment sump top. *See FIGURE 16-1, Area B.*

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

16.2.5. Set the street box, and check for clearance to allow access and space to remove the watertight cover. *See FIGURE 16-1, Area C.*

16.2.6. Continue with backfill, as required, to subgrade. *See FIGURE 16-1, Area A.*

16.2.7. Maintain good drainage of water away from the access opening of the containment sump top when installing the surface pad. *See FIGURE 16-1, Area D.*

17. ADDING TANKS AT EXISTING LOCATIONS

17.1. GENERAL

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

17.1.2. Backfill support around the existing tanks must not be disturbed.

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

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

17.2. PREFERRED METHOD

17.2.1. The preferred method is to install new tank(s) in a separate hole if space allows and/or if existing tank(s) must remain in service during installation of the new tank(s). The preferred method is described here. *See FIGURE 17-1.*

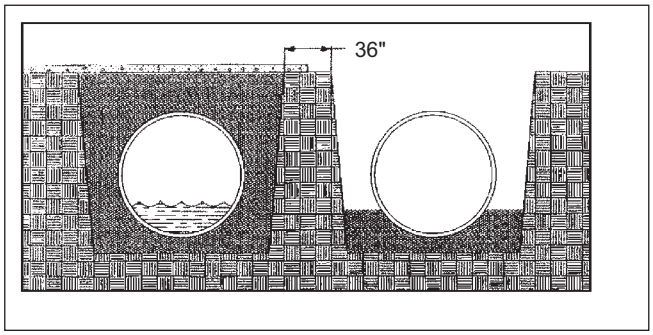


FIGURE 17-1

17.2.1.1. Install a new tank in a separate hole at least 3 feet from the original hole.

17.2.1.2. Follow procedures outlined in this Installation Manual.

17.2.1.3. Keep heavy and/or unusual surface loads off existing tanks when excavation hole is open.

17.2.1.4. Maintain the natural barrier of undisturbed soil between tanks.

17.2.1.5. *See SECTION 7.5.* for minimum spacing requirements between tanks.

NOTE: Sufficient soil must remain between the excavations so that the backfill in the original excavation does not shift.

17.3. ALTERNATE METHOD

17.3.1. If the preferred method outlined above is not possible or practical, an alternate method is described here. *See FIGURE 17-2.*

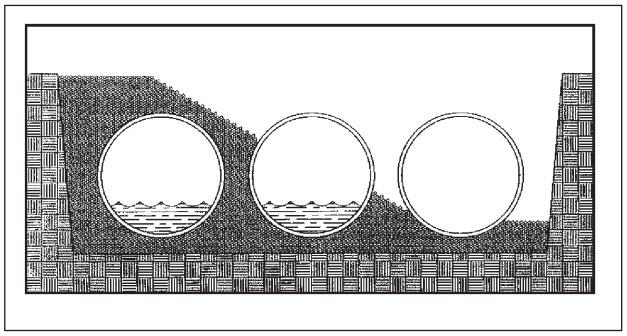


FIGURE 17-2

17.3.1.1. Bury additional tanks in the same installation hole.

17.3.1.2. Empty existing tanks to less than one-quarter (1/4) of capacity.

17.3.1.3. Remove the surface slab.

17.3.1.4. Enlarge the excavation for the new tanks, but leave as much backfill as possible around the existing tanks.

17.3.1.5. Install shoring, if necessary, to make sure that existing tanks do not move and that sufficient backfill remains around them.

⚠ WARNING

Failure to shore tanks if necessary to keep the existing tank(s) from moving could result in death or serious injury.

17.3.1.6. Follow the procedures and requirements for installing the tanks *as outlined in this Installation Manual.*

17.3.1.7. *See SECTION 6* for backfill requirements, *and SECTION 7* for excavation and spacing requirements.

⚠ CAUTION

If any existing tank(s) should move during the installation of new tanks, they must be removed and reinstalled according to tank manufacturer's instructions. Failure to follow this caution may result in minor or moderate injury.

18. OPERATING GUIDELINES

18.1. GENERAL

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

18.1.2. 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.

18.1.3. Consult supplemental materials (*see SECTION 20*), tank brochures, separate product instructions (such as oil/water separators) and separate accessory instructions, which are available upon request from the Xerxes customer service coordinator. Most of these documents are also available at www.xerxes.com.

18.1.4. Consult the applicable limited warranty for further operating guidelines and limitations. A copy of the applicable Xerxes limited warranty is found in the printed material that accompanies each tank, in each applicable product brochure and at www.xerxes.com. It is also available upon request from the Xerxes customer service coordinator.

18.2. TEMPERATURE LIMITS FOR STORED PRODUCTS AND MATERIALS

18.2.1. 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 result in damage to the tank and/or surrounding property.

CAUTION

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

18.2.2. All products and materials must be stored at ambient temperature except as follows:

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

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

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

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

18.2.2.4. 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 result in damage to the tank and/or surrounding property.

18.3. ENTERING TANKS

18.3.1. 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.

18.4. FILLING TANKS (IN GENERAL)

18.4.1. Never overfill the tank.

18.4.2. If pump- or pressure-filling a tank, owner/operator must take precautions to prevent overpressurization.

⚠ WARNING

Overpressurizing the tank could result in tank failure, and could result in death or serious injury.

⚠ WARNING

If a tank does not have overfill protection, the vent must be unrestricted and the vent size must be equal to or greater than the fill. Failure to follow this warning could result in death or serious injury.

18.5 FILLING UL-LABELED TANKS

⚠ WARNING

Xerxes does not recommend pump- or pressure-filling of the tank because an overfill or overpressurization could occur. Overfilling the tank while under pressure could cause tank failure even if the tank is vented properly. Failure to follow this warning could result in tank failure, and could result in death or serious injury.

18.5.1. Each time the tank is filled, the owner/operator must make sure the tank is properly vented. *See SECTION 14.*

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

18.5.3. If a tank has a vent-restriction device (ball-float valve), Xerxes recommends that the tank be gravity-filled only.

18.5.4. Owner/operator must notify whoever fills the tank if the tank has overfill protection, which reduces the tank's capacity.

18.5.5. Before each tank filling, owner/operator or the delivery service must determine the tank's reduced capacity due to the overfill protection, then 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.

18.5.6. Owner/operator must ensure that the fill line and drop tube are adequately grounded to prevent static discharge during filling.

18.5.7. Initial fill rate should be controlled to limit the possibility of product sloshing.

19. LIMITED WARRANTIES

19.1. GENERAL

19.1.1. 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 applicable Xerxes limited warranty is found in the printed material that accompanies each tank, in applicable product brochures and at www.xerxes.com. It is also available upon request from the Xerxes customer service coordinator.

20. SUPPLEMENTAL MATERIALS

20.1. GENERAL

20.1.1. Supplemental materials, which may apply to specific installations and/or conditions, are available upon request from the Xerxes customer service coordinator or from technical support at Xerxes Minneapolis, MN. Most supplemental materials are also available at www.xerxes.com.

20.1.1.1. Among those materials available from the Xerxes customer service coordinator and at www.xerxes.com are the following:

- Diesel Exhaust Fluid (DEF) Tank Installation Instructions
- Double-Wall Containment Sump Installation Instructions
- Field Fiberglass Lay-Up Instructions for Containment Sumps
- Flexible Dipstick Monitoring Instructions
- Large Bottom Sump Installation Instructions
- Man-Out-of-Hole (MOH) Strap Instructions
- New York City Double-Wall Tank Installation/Testing Supplement
- Prefabricated Deadmen Installation Instructions
- Preinstallation Testing Instructions for Water/Wastewater Tanks Factory-Equipped for Pressure Testing
- Primary Backfill Requirements
- TRUCHEK® Brochure
- Single-Wall Containment Sump Installation Instructions for Flat-Sided Containment Sumps
- Single-Wall Containment Sump Installation Instructions for Round-Sided Containment Sumps
- Split Backfill Instructions
- Triple-Wall Tank Preinstallation Testing Instructions
- Two-Part Sealant Mixing/Handling Instructions
- Watertight Cover Gasket Replacement Instructions
- Wet Well Installation Instructions and Operating Guidelines.

20.1.1.2. Among those materials available from technical support at Xerxes Minneapolis, MN, are the following:

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

21. RETENTION OF INSTALLATION MANUAL

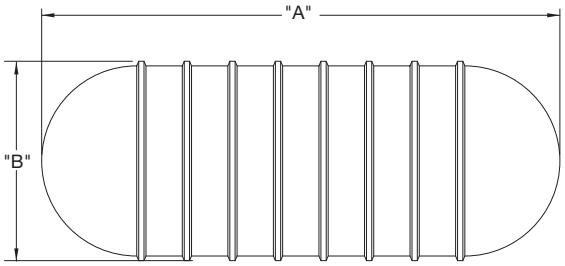
21.1. GENERAL

21.1.1. After installation, tank installer must give the Installation Manual and the completed Tank Installation Checklist to the tank owner.

21.1.2. After installation, tank owner must retain the Installation Manual for future reference to operating guidelines. Tank owner must also retain a copy of the Tank Installation Checklist.

APPENDIX A: XERXES TANK DATA CHART *

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



NOTES:

* This chart is for Xerxes fiberglass single-compartment underground storagetanks. For information on additional tank sizes, go to www.xerxes.com.

** If an overfill-protection device is installed in the tank, the actual capacity will be reduced.

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

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

APPENDIX B: XERXES PRIMARY BACKFILL REQUIREMENTS

B1. GENERAL

B1.1. The backfill material surrounding an underground storage tank (UST) is a critical part of a proper tank installation. This document gives guidelines for choosing the primary backfill material to use when installing Xerxes fiberglass tanks.

B1.2. The Xerxes Installation Manual specifies that select rounded stones or crushed stones are to be used as primary backfill material.

B1.3. Primary backfill material is to be clean, free-flowing, and free of dirt, sand, large rocks, roots, organic materials, debris, ice and snow.

B1.4. No backfill material shall be frozen or contain lumps of frozen material at any time during placement.

B1.5. Another 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.

B1.5.1. Materials like soft limestone, sandstone, sea shells or shale should not be used as backfill because they break down over time.

B2. ACCEPTABLE BACKFILL MATERIALS

B2.1. Coarse aggregate is a technical term for the material (rounded stones and crushed stones) that meets Xerxes' backfill size requirements.

B2.2. ASTM International and The American Association of State Highway and Transportation Officials (AASHTO) have specifications for standard sizes of coarse aggregate.

B2.3. TABLE B1-1 gives the standard sizes of coarse aggregate that meet Xerxes' backfill material specifications for rounded stones and crushed stones. It identifies standard sieve sizes used to grade aggregate material. For each aggregate size, the amount of material finer than each laboratory sieve (square openings) is given as a percentage of the total weight of the sample.

NOTE: ASTM uses size numbers 6, 67, 7 and 8 to describe specific gradation profiles for materials that pass through a series of sieves. Do not confuse these gradation profiles with sieve sizes.

B2.3.1. The percentages give an indication of the particle size distribution or gradation within a given aggregate size. With aggregate size number 6 of rounded stones, for example, 20–55 percent of the sample (measured by weight) should pass through a 1/2-inch sieve. And, with aggregate size number 7 of crushed stones, 0–15 percent of the sample (measured by weight) should pass through a No. 4 sieve.

B2.4. Some material suppliers may produce materials that meet Xerxes' requirements but are not identified by a standard coarse aggregate size number. The supplier should be able to provide a specification that identifies the size or gradation of the material.

B2.4.1. If the material supplier is unable to supply a gradation report, an independent testing laboratory can perform a sieve analysis on a sample of the material according to the ASTM C 136 testing specifications. The test results can then be compared against the size requirements for rounded or crushed stones *shown in table B1-1.*

B3. ROUNDED STONES

B3.1. When using select rounded stones, the material is to be a mix of rounded particles, sizes between 1/8 inch and 3/4 inch.

B3.2. The rounded stones must conform to the specifications of ASTM C 33, sizes 6, 67 or 7.

B3.3. No more than 5 percent (by weight) of the backfill may pass through a #8 sieve. *See TABLE B1-1* for additional information about specifications.

NOTE: Generally, rounded stones that meet the gradation requirements are larger than allowable crushed stones.

B4. CRUSHED STONES

B4.1. When using crushed stones, the material is to be a mix of angular particles, sizes between 1/8 inch and 1/2 inch.

B4.2. The crushed stones must conform to the specifications of ASTM C 33, sizes 7 or 8.

B4.3. No more than 5 percent (by weight) of the backfill may pass through a #8 sieve. *See TABLE B1-1* for additional information about specifications.

TABLE B1-1—Percent of Stones Passing Through Sieve by Sieve Size

Sieve Size	Rounded Stones			Crushed Stones	
ASTM C 33 Size #	#6 Stone	#67 Stone	#7 Stone	#7 Stone	#8 Stone
1 inch [25 mm]	100 %	100 %	———	———	———
3/4 inch [19 mm]	90—100 %	90—100 %	100 %	100 %	———
1/2 inch [12.5 mm]	20—55 %	———	90—100 %	90—100 %	100 %
3/8 inch [9.5 mm]	0—15 %	20—55 %	40—70 %	40—70 %	85—100 %
No. 4 .0187 inch [4.75 mm]	0—5 %	0—10 %	0—15 %	0—15 %	10—30 %
No. 8 .094 inch [2.36 mm]	———	0—5 %	0—5 %	0—5 %	0—10 %

APPENDIX C: XERXES SPLIT BACKFILL INSTRUCTIONS

C1. GENERAL

C1.1. Use select rounded or crushed stones for primary backfill material *as specified in the Xerxes Installation Manual in effect at time of installation, and the Xerxes APPENDIX B (and supplement), Primary Backfill Requirements.*

C2. SPLIT BACKFILL INSTALLATION

C2.1. Use the primary backfill material vertically up to at least 75 percent of the tank diameter. *See FIGURE C1-1.*

C2.2. *Follow the instructions in SECTION 6 of the Installation Manual* on the placement of this backfill material.

C2.3. Install a layer of geotextile filter fabric over the entire surface of the primary backfill material. *See SECTION 9* for more information about geotextile filter fabric.

C2.3.1. All joints in the filter fabric should be overlapped a minimum of 12 inches.

C2.3.2. Geotextile fabric must overlap onto the tank and excavation surface a minimum of 12 inches.

C2.3.3. Installations with unstable soil may require that the fabric line the entire excavation. *See SECTION 9* for specific information about using geotextile filter fabric in unstable-soil conditions.

C2.4. Clean native backfill may be used as secondary backfill material above the geotextile fabric to subgrade.

C2.4.1. Secondary backfill material must be clean, free-flowing, and free of large rocks, roots, organic materials, debris, ice and snow. Backfill material shall not be frozen or contain lumps of frozen material at any time during installation.

C2.5. Secondary backfill must be compacted to achieve a minimum of 85 percent standard proctor density.

C2.5.1. Do not use rammer-type compactors over the top of the tank.

C2.5.2. Some tank owners may require sample testing and written reports to verify the compaction of the backfill.

C2.6. Material must be installed in 12-inch to 24-inch lifts compatible with the compaction equipment used.

C2.7. In some conditions, frost heave may be encountered when using secondary backfill. Therefore, consider any problems that may occur.

C2.8. Specifications for secondary backfill material and compaction above the filter fabric layer may be determined by the requirements of the piping, surface slab or roadway.

C2.9. Refer to applicable codes or standards for base course and sub-base course material and compaction requirements.

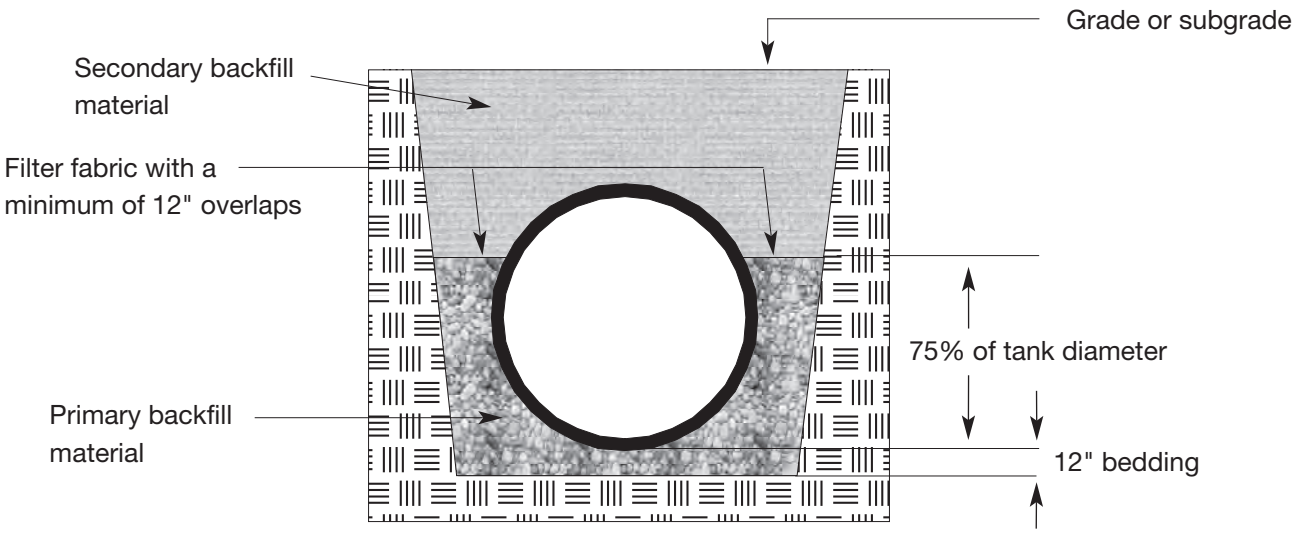
C2.10. The following are examples of acceptable secondary backfill material:

C2.10.1. clean native backfill

C2.10.2. coarse sand or gravel

C2.11. One hundred percent (100%) of all backfill material must pass through a 1-inch sieve.

FIGURE C1-1—Split Backfill Installation



XERXES TANK INSTALLATION CHECKLIST

The tank owner should retain a copy of the completed Tank Installation Checklist in order to facilitate any warranty claim. Unless other information is requested, initial each step to verify that the item has been performed or installed per Installation Manual specifications and instructions.

A1. GENERAL INFORMATION

Date of Installation _____

Address of Installation _____ _____

Tank Owner Name _____ Telephone _____ Email _____

Address _____

Contractor Name _____ Telephone _____ Email _____

Address _____

A2. TANK INFORMATION

Tank Number	Tank #1	Tank #2	Tank #3	Tank #4
UL# (from tank label)				
Nominal Tank Diameter (in feet) & Capacity (in gallons)				
Tank Type (SW, DW, MC, OWS, Other, **and** Wet or Dry)				

A3. PREINSTALLATION (*See SECTIONS 2 and 3* for instructions and specifications.)

Visual Inspection (no damage)				
Tanks shipped under vacuum (SECTION 4.3. requirements met)				
Tanks with monitoring fluid (record fluid level in reservoir and check for absence of fluid in or on tank)				
Tank passed pressure/soap test if req'd				

A4. DIAMETER MEASUREMENTS (*See SECTION 11* for instructions and requirements. Mark location of measurements on site sketch.)

Measurement #1 (before installation)				
Measurement #2 (straps installed)				
Measurement #3 (backfilled to top of tank)				
Measurement #4 (backfilled to subgrade)				
Deflection measurement (#1 — #4)				
Measurement meets req'ts of TABLE 11-1				

A5. INSTALLATION (*See SECTIONS 5, 6, 7, 8, 9, 12 and 14* for instructions and specifications.)

Primary backfill material				
Secondary backfill material (if used)				
Traffic loads (indicate yes or no)				
Excavation (size and condition)				
Hole condition (indicate dry or wet)				
Backfill bedding				
Tank spacing (between tanks and from excavation walls)				
Anchoring (indicate system used: none, deadmen or anchor slab)				
Anchoring (if used)				

XERXES TANK INSTALLATION CHECKLIST continued

Tank Number	Tank #1	Tank #2	Tank #3	Tank #4

A5. INSTALLATION continued (*See SECTIONS 5, 6, 7, 8, 9, 12 and 14* for instructions and specifications.)

Anchor straps (if used)				
Geotextile (if used)				
Backfill placement & compaction				
Ballasting (if wet hole)				
Fittings & other metal components (coated for corrosion protection)				
Depth of backfill over tank (specify)				
Level of backfill after final inspection				
Type and thickness of surface pad				
Piping connections per requirements				

A6. POSTINSTALLATION (*See SECTIONS 13, 15 and 16* for instructions and specifications.)

Postinstallation tests for air-testable tanks				
Optional hydrostatic test				
Monitoring-fluid tanks (set fluid level when backfilling & top slab are complete, and record level in reservoir here)				
Monitoring-fluid tanks (verify there is no fluid inside tank)				
Containment sump (water test successful)				

A7. SITE SKETCH (Indicate specifics of tank installation.)

A8. ADDITIONAL NOTES
(including variations and/or deviations from instructions, with written authorizations attached)

A9. VERIFYING SIGNATURES

CONTRACTOR — Name _____ Date _____

I verify that this information is a true record of the installation of the tanks listed here.

Signature _____

TANK OWNER/REPRESENTATIVE — Name _____ Date _____

I verify that this information is a true record of the installation of the tanks listed here, and that I have received a copy of the Installation Manual and this Tank Installation Checklist.

Signature _____

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XERXES TANK INSTALLATION CHECKLIST continued

Tank Number	Tank #1	Tank #2	Tank #3	Tank #4

A5. INSTALLATION continued (*See SECTIONS 5, 6, 7, 8, 9, 12 and 14* for instructions and specifications.)

Anchor straps (if used)				
Geotextile (if used)				
Backfill placement & compaction				
Ballasting (if wet hole)				
Fittings & other metal components (coated for corrosion protection)				
Depth of backfill over tank (specify)				
Level of backfill after final inspection				
Type and thickness of surface pad				
Piping connections per requirements				

A6. POSTINSTALLATION (*See SECTIONS 13, 15 and 16* for instructions and specifications.)

Postinstallation tests for air-testable tanks				
Optional hydrostatic test				
Monitoring-fluid tanks (set fluid level when backfilling & top slab are complete, and record level in reservoir here)				
Monitoring-fluid tanks (verify there is no fluid inside tank)				
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(including variations and/or deviations from instructions, with written authorizations attached)

A9. VERIFYING SIGNATURES

CONTRACTOR — Name _____ Date _____

I verify that this information is a true record of the installation of the tanks listed here.

Signature _____

TANK OWNER/REPRESENTATIVE — Name _____ Date _____

I verify that this information is a true record of the installation of the tanks listed here, and that I have received a copy of the Installation Manual and this Tank Installation Checklist.

Signature _____

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