

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 turn-buckle 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.

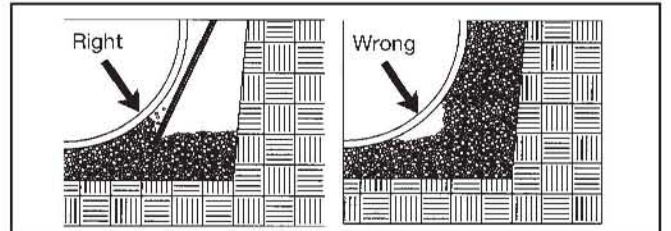


FIGURE 5-1

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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 8.6. 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.

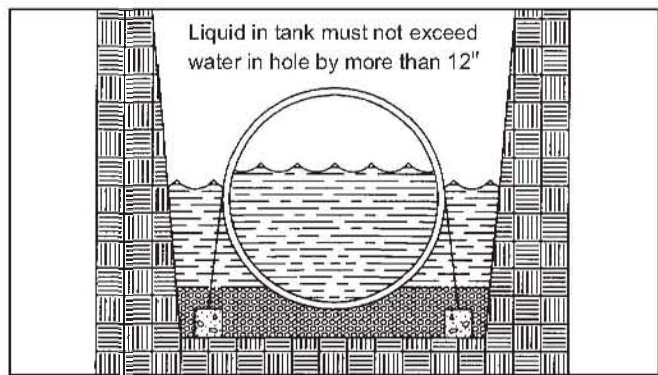


FIGURE 5-2

- 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.

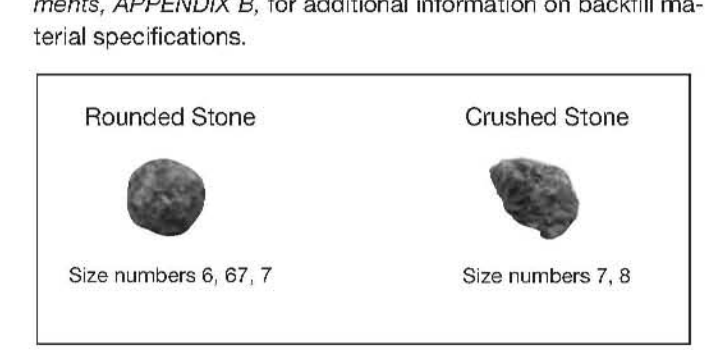


FIGURE 6-1

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.

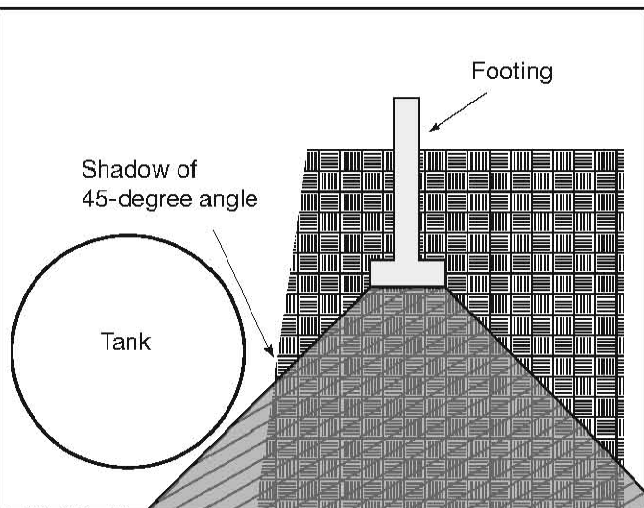


FIGURE 7-1

- 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.

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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.

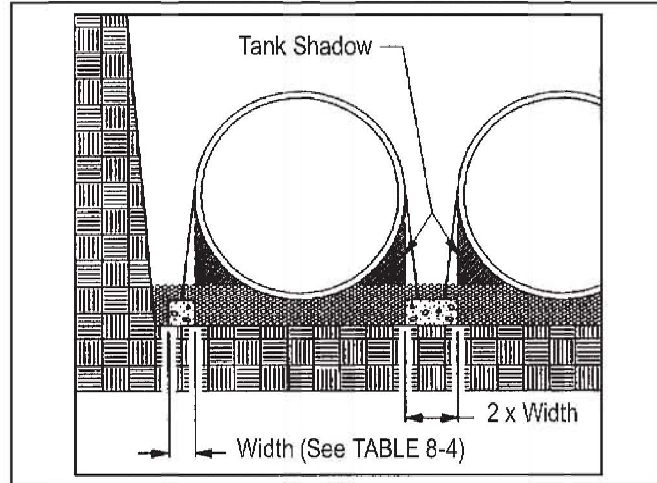


FIGURE 7-2

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.

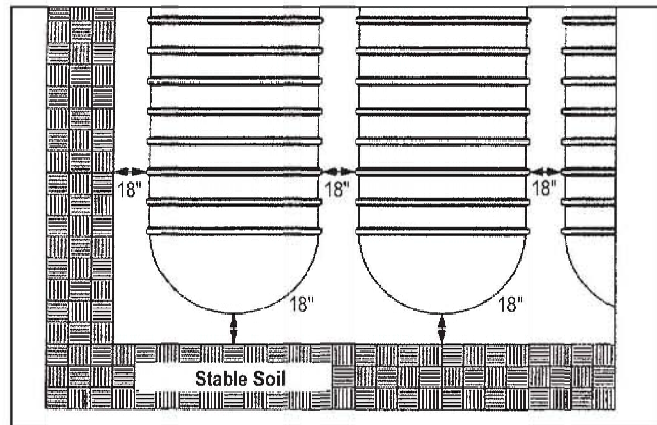


FIGURE 7-3

- 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 deadmen 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.

