

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.

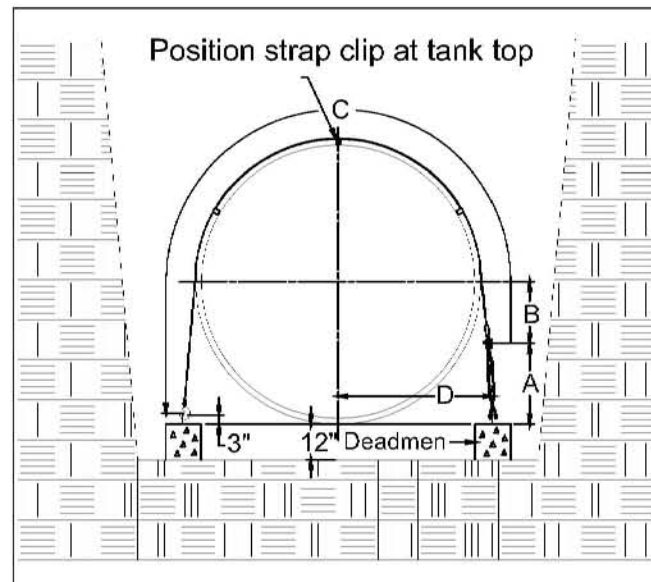


FIGURE 8-1

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.

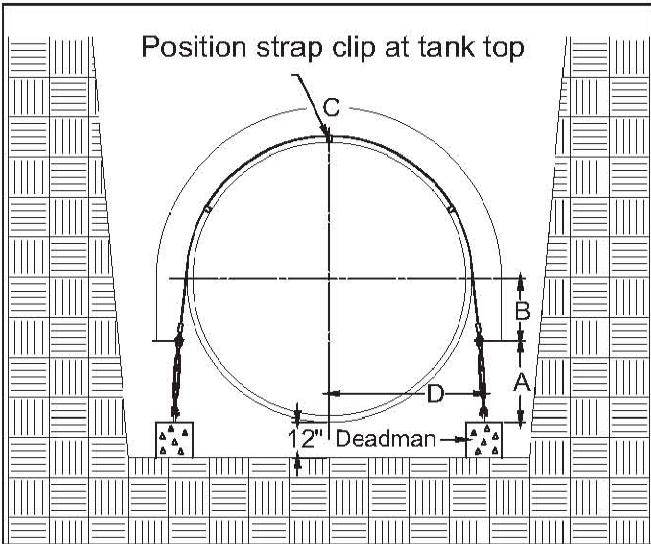


FIGURE 8-2

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'-4"	52"	58"
10'	45"	15"	18'-8 3/4"	69"	75"
12'	50"	23"	22'-6 3/4"	87"	93"

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).

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

Over-sized hardware may damage the strap eye and may result in minor or moderate injury.

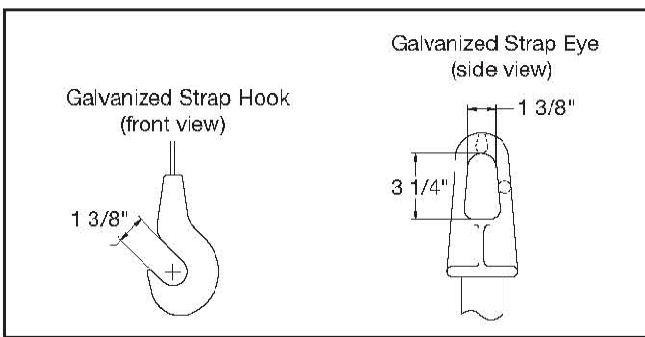


FIGURE 8-3

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.

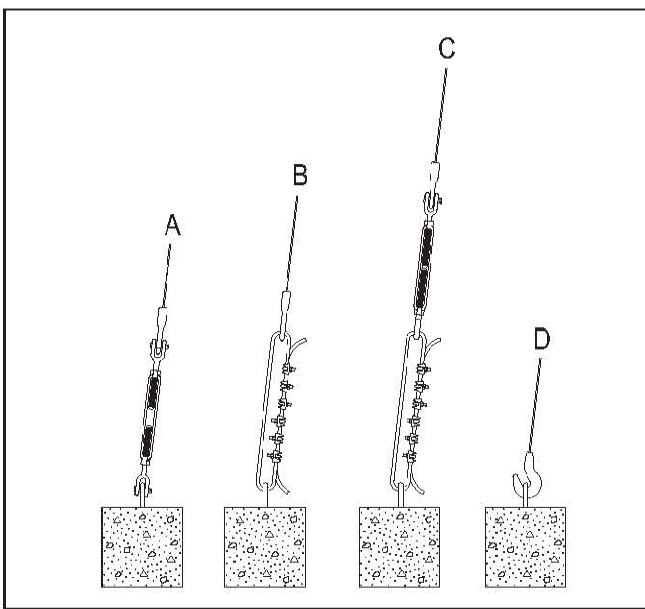


FIGURE 8-4

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.

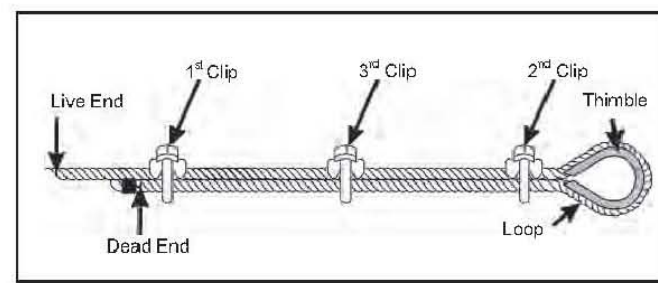


FIGURE 8-5

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.

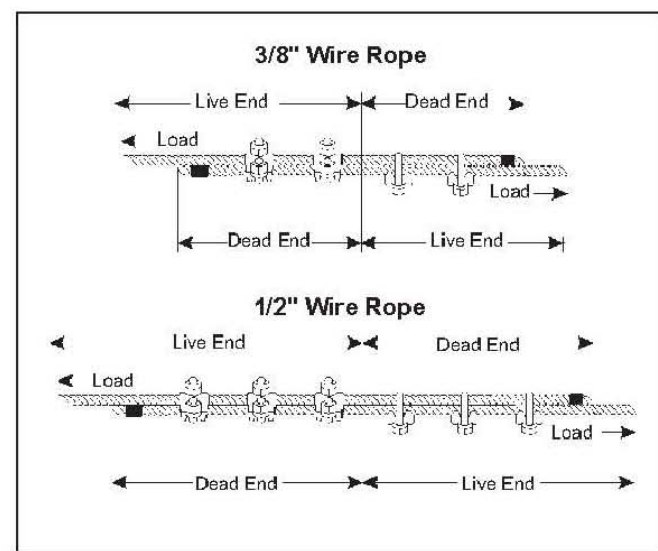


FIGURE 8-6

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 deadman 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 deadman 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 deadman, 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 deadman 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.

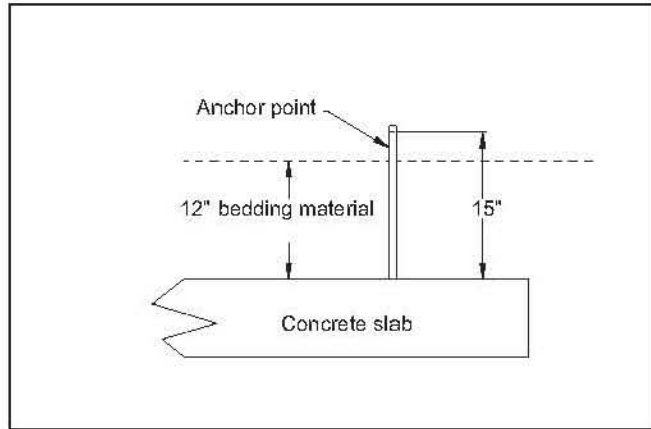


FIGURE 8-7

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.

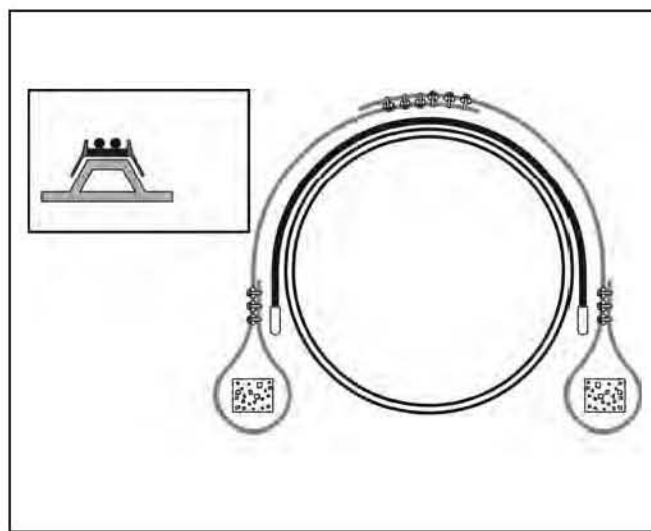


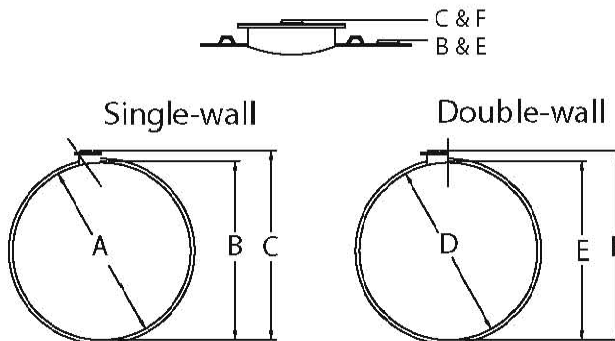
FIGURE 8-8

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.

Tanks with Manways

Single-wall and Double-wall



NOTES:
1. All fitting dimensions are measured from the top of a service fitting to the inside bottom of the tank and include striker-plate clearance.
2. Interior diameters do not include striker-plate clearance.

FIGURE 14-1

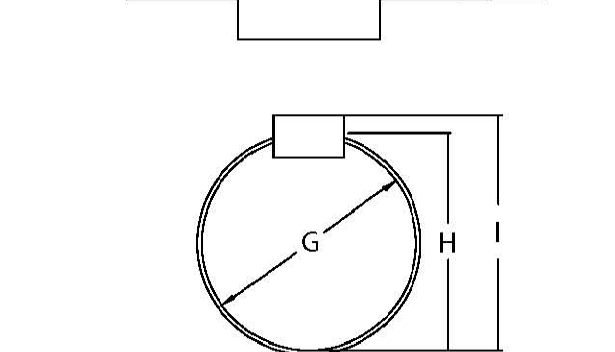
Dimensions for FIGURE 14-1						
Tank Dia.	A	B	C	D	E	F
4'	48"	49 1/2"	54 1/2"	48"	49 1/2"	54 1/2"
6'	71 3/8"	73"	78"	73 3/4"	72 1/2"	77 3/4"
8'	91 1/4"	93"	98"	90"	91 3/4"	97"
10'	119 1/4"	121"	126"	118"	119 3/4"	125"
12'	136 5/8"	138 1/4"	143 1/4"	—	—	—

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.

Tanks with Access Openings

Single-wall and Double-wall



G = Internal diameter of the tank
H = distance between the inside bottom of the tank and the internal flange of the access riser
I = distance between the inside bottom of the tank and the top of the access opening

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.

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.

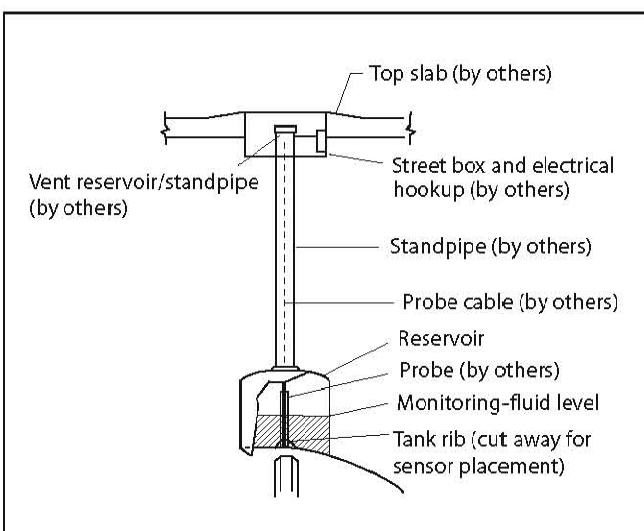


FIGURE 15-2

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 subsurface pump and a termination point for secondary piping systems.

16