

Section 6 Bedding and Backfill Instructions for ZCL Tanks using ZCL Tank Anchors

1. Prepare Excavation

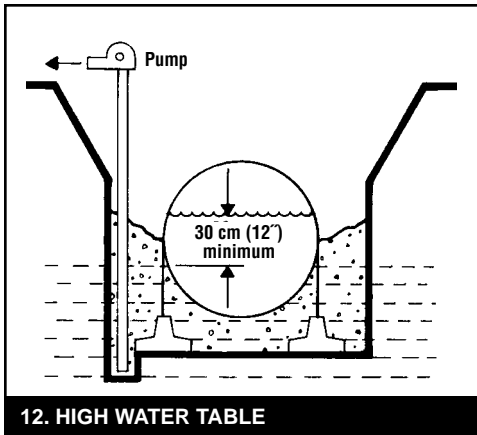
Prepare excavation according to required size and depth. Remove all loose soil. Level bottom of hole. Use Primary Backfill material (not soil) to fill low areas in excavation. If geotextile fabric is to be used around Primary Backfill, it should be placed in hole at this time.



WARNING

Follow safe construction practices. Backslope excavations or provide temporary protective structures as required. Use barricades around construction site. Use caution near heavy equipment and near slung loads. Use properly rated and properly maintained lifting slings. **THINK SAFETY.**

For **Wet Hole** install appropriate pumping equipment. A shallow pump-out well, filled with Primary Backfill material, may be installed at the corner(s) of the excavation. Maintain water level as low as possible. Remove all loose soil from excavation. Level bottom of hole using Primary Backfill material. Install geotextile fabric (if applicable) over top of leveling material and pump-out well.

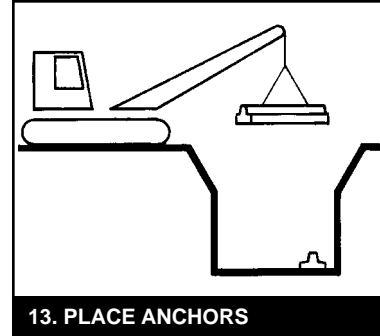


2. Tank Pre-Installation Test

Perform Pre-Installation Testing, as per Section 3.

3. Place Tank Anchors

Place Tank Anchors into excavation. **ZCL** Tanks require sets of 2, 4 or 6 deadmen anchor beams, depending on the length of the tank. (Refer to **ZCL** Tank Specification Sheet for overall tank dimensions and anchor details.) When installed, the combined length of the **ZCL** Anchor sets are the same length as the tank to which they are attached; align the anchor beams in the same manner as tanks. For multi-tank installations, the anchors between the tanks should be installed side by side with the bases touching, and with the required anchor spacing



(centerline to centerline) set as shown in Table #1. This will provide the appropriate minimum spacing between tanks as per Section 5. For tanks requiring 4 or 6 anchors, the anchor beams are “match marked” to facilitate correct orientation and tie down spacing during installation.

Tank Anchors must be level and firmly supported on bottom of excavation. Use Primary Backfill material to level and support Tank Anchors.

4. Place Bedding

Place a smooth and level bed of Primary Backfill material in bottom of excavation, around and over the bases of the Tank Anchors. Minimum thickness of bedding layer is 30 cm (12 inches). For **ZCL** Model 60, 86 and 100 Tanks using **ZCL** Tank Anchors, the minimum depth of bedding is level with the bottom of the molded notches in Tank Anchors. For Model 40 Tanks the bedding material is level with the top of the Tank Anchors. If soft conditions or difficulties controlling water accumulation are encountered, increase bed thickness to 45 cm (18 inches) and set **ZCL** tank anchors 15 cm (6 inches) up off bottom of the excavation.



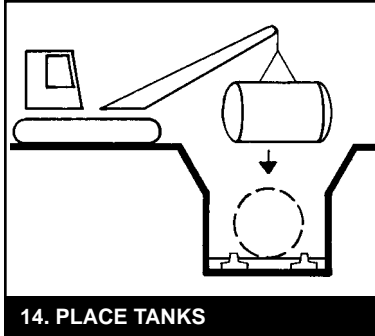
CAUTION

Level bedding material precisely, else Tie-Down Straps may not fit properly.

5. Place Tanks

Place tanks onto prepared bed, centering tanks between Tank Anchors. Ensure tanks are level and properly spaced. Align tanks with anchors for proper placement of straps. Gently place approximately 15 to 30 cm (6 to 12 inches) of Primary Backfill around bottom of tanks between the ribs (if present) and under the end domes until **all voids** are filled. Use tamping bar to push material under tank until solid resistance is felt. A long wooden shovel handle, or length of 1x4 board, is a practical choice for a tamping bar. **Do Not use metal probes. Do Not strike tank.** Recheck tanks for level and spacing after tamping.

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14. PLACE TANKS



For **Wet Hole** installation, attempt to maintain the water level below the top of the bedding material until the tank can be fully backfilled and ballasted. If this is possible, then the tanks may be installed according to these instructions without additional precautions.



WARNING

In wet hole conditions never leave tanks empty, even if anchored, until the backfill is completed to grade.

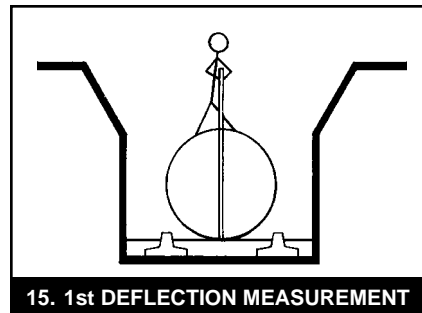
For **HIGH WATER TABLE CONDITIONS**, where it is not possible to maintain the water level below the top of the bed during the entire installation procedure, the tank must be placed using liquid ballast to firmly seat the tank into the bedding material and to keep the tank from floating. Position the tank between anchors. Fill tank with liquid to approx. 30 cm (12 inches) above the water level in the hole, or until tank settles firmly onto bedding material. Place 15 to 30 cm (6 to 12 inches) of Primary Backfill around sides and ends of tank and tamp with bar to fill all voids as per standard procedure. Continue installation as per standard procedure, except to add additional ballast to tank while backfilling such that the level of ballast and level of backfill remain within approx. 30 cm (12 inches) of each other. Level of

ballast **must** exceed the level of water in hole by 30 cm (12 inches) until top of tank is reached. Maintain ballast in tank until backfilling is complete and surface pad is in place.

6. First Deflection Measurement

Deflection measurements must be taken at, at least, one location on each tank after setting in hole. This is necessary to confirm the proper backfill placement and to validate the **ZCL** Warranty. Measure and record the distance from the bottom edge of tank fitting to the center of the bottom protection plate below that fitting.

(Record measurement on page 23.)



15. 1st DEFLECTION MEASUREMENT

7. Install Tie-Down Straps

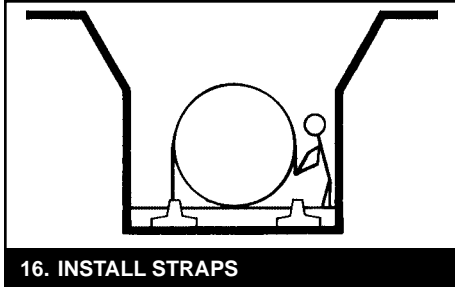
The Tie-Down Strap System consists of a corrosion-resistant fiberglass strap (with hook attachment on each end), three aluminum centering clips (for tanks with external ribs), and a turnbuckle (with eye on one end and hook on the other). For P-60 and P-86 models, position the three clips on the fiberglass strap to rest at approximately the 10 o'clock, 12 o'clock and 2 o'clock positions on the correct tank ribs. For P-100 Tanks use four clips equally spaced between the 10 o'clock and 2 o'clock positions. Place one hook end of the strap around the bar in the Tank Anchor and position the strap over the tank. Align the strap only on ribs marked (▶◀). Place the hook end of turnbuckle around the bar in the opposite anchor and insert the eye of the turnbuckle over the other hook on the strap. Adjust the turnbuckle until the strap is snug. **Do Not Overtighten**. Repeat procedure at each Hold-Down position along the tank, as indicated by notches in the Tank Anchors and arrows on tanks.



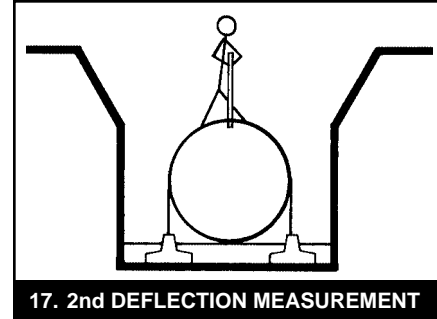
CAUTION

Tie-Down Straps must be placed over ribs or at locations marked (▶◀). Only ZCL Tie-Down Straps are recommended for use with ZCL Tanks. All Tie-Down Straps must be uniformly tight.

Section 6 Bedding and Backfill Instructions for ZCL Tanks using ZCL Tank Anchors (continued)



Refer to
Anchor
Straps,
page 21

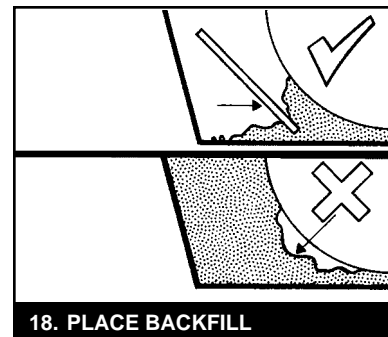


CAUTION

If the Tie-Down Strap appears too short or there is not sufficient adjustment in the turnbuckle to bring the strap snug, then the tank and/or tank anchors must be repositioned by adding or removing bedding material until proper installation can be achieved. Tamp again to remove all voids under tank. Maintain 30 cm (12 inch) minimum bedding thickness and correct depth of cover.

9. Place Backfill

Tanks may now be backfilled to the level of the top of the tank. **NOTE: Only ZCL approved Primary Backfill Material may be used immediately around and over the tank.** Place backfill carefully in maximum 30 cm (12 inch) lifts. Push and probe the backfill under the haunches of the tank, between ribs and under end caps to eliminate voids and provide necessary support. **This is critical to ensure successful installation.** Deposit backfill material evenly on opposite sides of the tanks so that tanks do not shift. Continue **hand tamp** process as required with each backfill layer until at least halfway up tank wall.



8. Second Deflection Measurement

(After straps are snug)

Prior to commencement of backfilling, repeat deflection measurement at same fitting locations to confirm that tank has not been distorted by hold-down straps. If excessive deflection is found, adjust tension on straps such that any reduction in the vertical measurement is within 1 cm ($\frac{3}{8}$ inches) of the First Reading.

(Record 2nd measurement on page 23.)



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NOTE: 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.

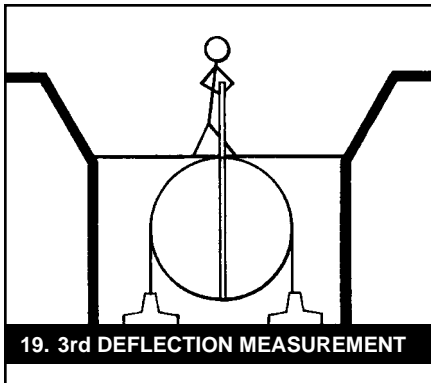
NOTE: If geotextile filter fabric is to be used in the installation, it must be placed between the Primary Backfill material and any surrounding soil or Secondary Backfill materials.

NOTE: Tanks may be ballasted with liquid during backfilling. Level of liquid ballast should not exceed the level of backfill by more than 60 cm (24 inches) at any time during the backfill procedure.



WARNING

Tanks must not be allowed to shift during backfill procedure. Should a tank shift, it must be thoroughly hand tamped to eliminate all voids under tank. If backfilling has proceeded above 1/4 of the tank diameter, it may be necessary to remove and reinstall tank to ensure elimination of all voids.



10. Third Deflection Measurement

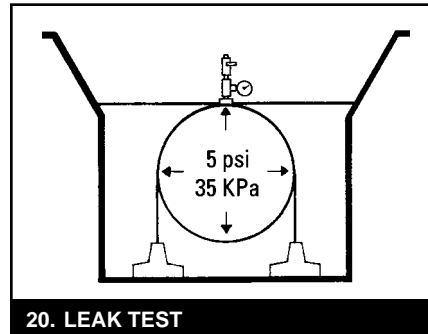
With backfill level with top of tank, measure and record distances at same fitting locations. (Record on page 16.) Calculate the differences between the First Reading and Third Reading for each tank and compare with the following chart. The installation is satisfactory if the differences in readings are less than values given on the chart. If differences between First and Third Readings are greater than the values given on the chart, contact ZCL Representative for further instructions.

Table #3: Allowable Deflection for Buried Tanks

Model 40 Series	1.2 m (4 ft.) dia.	1.2 cm (½ in.)
Model 60 Series	1.8 m (6 ft.) dia.	1.6 cm (¾ in.)
Model 86 Series	2.6 m (8 ft.) dia.	3.0 cm (1½ in.)
Model 100 Series	3.1 m (10 ft.) dia.	3.5 cm (1¾ in.)

11. Leak Test

Installed tanks must be leak tested again to verify that tanks have not been damaged during installation and to validate the ZCL Warranty. Provincial regulations require testing of all newly installed tanks; the results of such tests are sufficient to validate the ZCL Warranty. In the absence of provincial regulation, ZCL recommends the use of any testing procedure meeting the requirements of National Fire Protection Association "Precision Test," as per Section 4.3.11.1 through 4-3.11.4 of the NFPA Pamphlet 329, "Underground Leakage of Flammable and Combustible Liquids."



WARNING

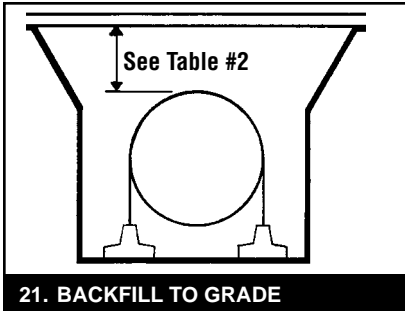
Maximum allowable test pressure on tank is 35 kPa (5 psi) at the top of the tank. **Do not** subject tank to vacuum. When not under test, tank must be vented at all times. If tanks have been ballasted with water, tanks may be air tested providing pressure at bottom of tank does not exceed 5 psi. **Do not** air test tanks containing flammable or combustible liquids or vapors.

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12. Backfill To Grade

After installation of piping (and other accessories as required) the site may be backfilled to grade. Approved Primary Backfill material **only** may be placed immediately **over** the tanks. Place backfill in maximum 30 cm (12 inch) lifts. Remove all temporary blocking and debris from around piping.

If depth of backfill over tank exceeds 45 cm (18 inches), the coarse sand or gravel meeting the specifica-



tions for Secondary Backfill (see Section 4) may be used to complete the installation above this level. The use of a filter fabric is recommended to separate the different backfill layers. The Secondary Backfill must be compacted to 95% relative compaction. Use small, hand-driven compaction equipment only.



CAUTION

Native backfill is not allowed directly over top of tanks. Select native backfill is allowed only around perimeter of installation. Compact all select native backfill to 95% Relative Compaction.



WARNING

Do not allow construction equipment to travel over or near partially buried tanks. No traffic is allowed over tanks until fully backfilled to grade with properly reinforced pad (if applicable) in place.

Section 7 Anchoring Systems

ZCL Tanks may be installed with alternate anchoring systems (those designed by others). The design of such alternate anchoring systems is the responsibility of the tank owner.

Follow the same installation procedure as outlined in these Installation Instructions, adapting as necessary to accommodate the specific features of the alternate anchoring system.

Observe the following precautions for the design and installation of alternate anchoring systems:

1. ZCL Tank Models 60, 86 and 100 must be anchored at the rib locations indicated marked (▶◀). Anchor straps for Model 40 tanks are located at each end of the tank shell where marked (▶◀).
2. Only ZCL Hold-Down Straps are recommended for use with ZCL Tanks. ZCL Hold-Down Strap Sets may be purchased separately. These sets consist of a corrosion-resistant Fiberglass Strap (with hook fittings), Alignment Clips, two Anchoring Loops (suitable for placing into wet concrete), and a Turnbuckle. Installation Instructions for proper assembly and use of Hold-Down Straps are provided with shipment.



WARNING

Do not use cables or chains for anchoring tanks.

3. Design anchoring system for the following vertical force per attachment point, according to tank size.

**Table #4
Minimum Design Loads for Anchor Bolts**

Model 40 Series	1250 kg (2800 lbs)
Model 60 Series	4200 kg (9200 lbs)
Model 86 Series	6250 kg (13,800 lbs)
Model 100 Series	6250 kg (13,800 lbs)

