

Installation Manual Underground Storage Tanks

ISSUE 6.04
05/2006



ZCL
COMPOSITES INC.

Table of Contents

Page

Section 1 Equipment for Tank Installations 1

Section 2 Shipping, Unloading and Storage of Tanks 2

Section 3 Pre-Installation Testing. 2

Section 4 Backfill Specifications 5

Section 5 Size of Excavation Requirements 7

Section 6 Bedding and Backfill Instructions for Tanks installed with
ZCL Anchor System. 9

Section 7 Alternate Anchoring Systems. 13

Section 8 Installing Tanks without Anchor Systems. 14

Section 9 Installation of Tank Internal Piping 14

Section 10 Adding Tanks to Existing Installation 14

Section 11 Double Wall Tank Monitoring Systems 15

Section 12 Turbine Enclosure Sumps and Collars 16

Exhibits A & B: Standard Sizes of Aggregate 19 & 20

ZCL Specification Sheet 21 & 22

Installation Checklist and Inspection Report. 23 & 24



WARNING

indicates hazards which, if not avoided, could cause death, serious personal injury or significant property damage.



CAUTION

indicates hazards which, if not avoided, may cause personal injury or property damage.

These instructions are issued as a guide for the installation of **ZCL** underground storage tanks, based on successful experience in a wide variety of situations. **ZCL** Storage Tanks have been investigated by Underwriters' Laboratories of Canada and comply with the requirements of ULC-S615-98 Standard for Reinforced Plastic Underground Tanks for Flammable and Combustible Liquids, including Petroleum products only or Petroleum products, Oxygenates and Oxygenated Fuel Blends (as appropriate).

These installation instructions are applicable for all **ZCL** underground storage tanks.

Compliance with the procedures and instructions contained in this Installation Manual are necessary for the proper installation of ZCL tanks. Failure to comply will void the warranty for the tank(s) and may cause tank failure.

In addition to the Manufacturer's Instructions, the installation must comply with the National Fire Code, and all applicable Federal, Provincial or Municipal construction, safety and environmental codes and regulations.



WARNING

Ensure compliance with regulations and industry standard practices for all aspects of the tank installation.

For any questions regarding the interpretation of these Installation Instructions, or if there are any unusual site conditions, contact your **ZCL** Representative.

The presence of a **ZCL** Representative does not relieve the installer's responsibility for appropriate installation of these tanks according to the following instructions.

Section 1 Equipment

The following equipment is recommended for installation of **ZCL** Tanks:

1. Excavation equipment capable of producing a level bottom hole and placing backfill material at any point in the excavation
2. Crane or lifting equipment capable of lifting and placing the tanks and associated Tank Anchors
3. Spirit level or transit
4. Tape measure – 15 m (50 feet)
5. Tamping rod(s) (A long wooden shovel handle is satisfactory.)
6. Pipe wrenches & appropriate pipe joint compound
7. Pressure gauge, fitting and valve. Gauge must be capable of accurately measuring 35 kPa (5 psi) pressure with minimum 5 kPa (1/2 psi) increments. Fitting must adapt to 4 inches NPT threaded opening.
8. Source of pressurized air capable of 35 kPa (5 psi)
9. Soap and water solution (for freezing weather use soap, water and anti-freeze solution)
10. Soft bristle paint brush or soft cloth
11. Hand shovel(s)
12. 2 m (6 foot) double lifting chain or sling with hook ends (Larger tanks (10 foot) require a 4-part lifting chain assembly.)
13. Soil compacting equipment (if necessary)

Section 2 Shipping, Unloading and Storage of Tanks

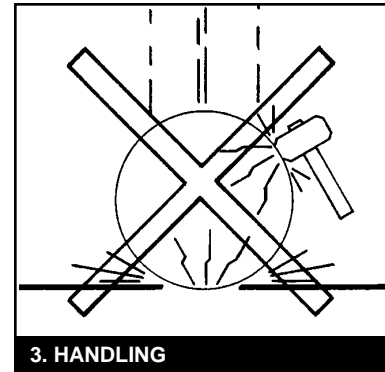
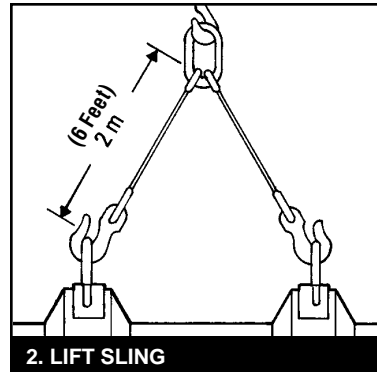
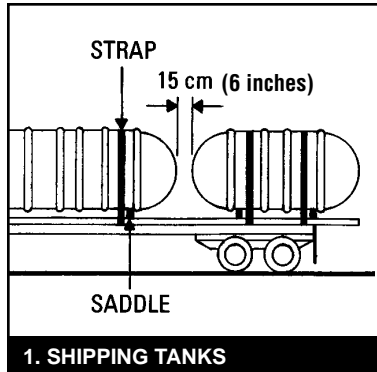
Tanks must be shipped on support saddles provided. Position saddles near each end of tank with weight distributed evenly. Do not place saddles under centre of tank. **Use nylon straps to hold tank.** Position straps over tank at the saddle locations. Do not strap at center of tanks. Do not use cables or chains to hold tanks.

Do not overtighten straps.

Move tanks by lifting and setting only. Do not move tanks by rolling or dragging. Lift by lift lugs only.

Two lift lugs are provided on all tanks (4 lugs for 10-foot diameter tanks); use all lugs for lifting. Use double sling with minimum 2 meter (6 feet) length for lifting.

Tanks must be unloaded by lifting on lugs provided. **Do not drop or roll tanks off truck.** Place tanks carefully on shipping cradles or on level, smooth ground, free of rocks or debris. Secure tanks against movement by use of chocks. Under wind conditions tank may have to be tied down.



Section 3 Pre-Installation Testing

All **ZCL** Tanks are tested and certified free of leaks at the factory, prior to shipment. **All tanks must be tested in the field, prior to installation,** to identify any damage resulting from shipping and handling, and to validate the **ZCL** Warranty. This test shall consist of:

1. A detailed Visual Inspection of the exterior of the tank, and
2. An Air/Soap Leak Test.
3. Prior to pressure test, ZCL requires that all plugs are removed, redoped and then tightened.



CAUTION

Do not install any pipe or fittings other than test fittings until all pre-installation testing has been completed.

A. Visual Inspection

All tanks shall be visually inspected over entire exterior surface. Special attention should be given to locations of shipping cradles and attachment straps. If any damage is present, the tank shall not be installed until inspected and repaired (if necessary) by **ZCL** Representative.

Do not attempt unauthorized repairs.

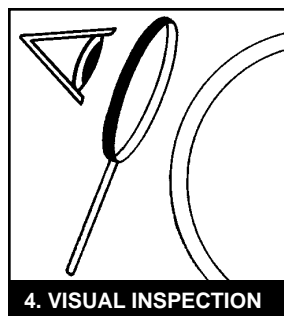
Inspect for the following defects:

1. Visible fractures in the walls or ribs

2. Delaminations

3. Scratches, abrasions, or gouges extending more than 1.5 mm ($\frac{1}{16}$ inch) into the surface of the fiberglass

4. Stress cracks (These are very fine, closely spaced cracks extending deep into the fiberglass)



B. Leak Test (Single Wall Tanks)

The Soap Bubble Test is used as a highly sensitive test for detection of leaks and to verify the integrity of all Single Wall Tanks. The procedure is as follows:

1. Position and clean tank (if necessary) so that entire exterior is visible.
2. Apply air pressure between 28 and 35 kPa (4 to 5 psi) to tank and hold.

Section 3 Pre-Installation Testing (continued)

3. Wet entire exterior surface of tank with a soapy water solution using a soft cloth or brush. During freezing conditions a suitable anti-freeze (such as windshield washer fluid) may be added to the soap and water mixture.
4. Inspect surface of tank over 10-to 20-minute period for the formation of air bubbles which would indicate a leak.
5. After completion of test, release air pressure and reinstall vent plug.

Should a leak be detected, **do not attempt repairs**. Contact your **ZCL** Representative.

C. Leak Test for Double Wall Prezerver Tanks with Dry Annular Space

For **ZCL** Double Wall Prezerver tanks, the leak test is conducted in 2 stages, to test the primary (inside) and the secondary (outside) tanks separately. The tests must be done in accordance with the following procedures in the sequence indicated:

Air Leakage Test (Primary Tank)



WARNING

Do not pressurize tanks over 5 psi. Tank damage or physical injury can result.

This test places a 35 kPa (5 psi) pressure on the primary tank while the annular space (between the inner and outer walls of the tank) is sealed. This annular space is then monitored to observe for a rise in pressure which may indicate a leak.

1. Position the tank on flat level area, free of rocks or debris and clean exterior (if necessary). When applicable, use suitable protective pads to roll tank during air/soap test.
2. Mount test equipment as indicated in diagram. Install pressure gauges at locations shown. Check gauges for initial 'zero' reading.
3. All **ZCL** Prezerver tanks are manufactured with at least one monitor well fitting attached to the outside of the tank which is open only to the annular space between the two tank walls. The monitor well fitting must be connected through a hose with a shut-off valve to another fitting (preferably on the manway cover if provided) leading directly into the

primary tank. **Close valve** between primary tank and annular space.

4. Connect air supply to any other manway fitting or other convenient fitting leading directly to the primary tank. Pressurize the primary tank to 35 kPa (5 psi) maximum and hold.

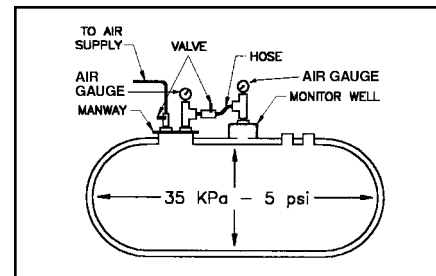


CAUTION

Never attempt to connect air supply directly to a monitoring well fitting or tank damage may result.

Allow a few minutes for the air temperature in the tank to stabilize. If necessary, add or remove air to achieve required 35 kPa (5 psi) test pressure.

5. Observe the gauge on the monitor well for minimum 30 minutes. A rise in pressure from the zero value may indicate a leak in the primary tank. During this period apply a soapy water solution and soap all tank fittings, manways, flanged nozzles and covers, etc., to verify leak tightness before proceeding.



5. AIR LEAKAGE TEST—Primary Tank



CAUTION

Pressure gauge readings can be affected by changes in ambient air temperature. Allow for pressure variations when tanks are subject to abrupt temperature changes.

Soap Bubble Test (Secondary Tank)

The Soap Bubble Test is used as a highly sensitive test for detection of leaks and to verify that the secondary (outside) tank has not been damaged during transportation.

The Soap Bubble Test may be performed immediately following the Air Leakage Test.

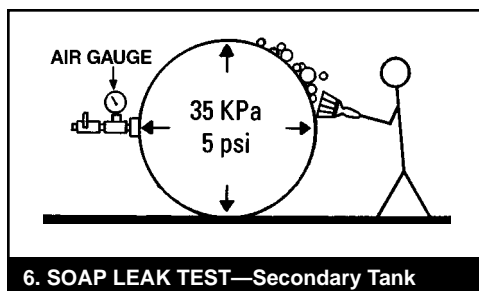
6. **Open valve** in the small line to the monitoring well and allow the air pressure to transfer from the primary tank to the annular space between the two tank walls. If necessary, add more air to the

Section 3 Pre-Installation Testing (continued)

primary tank until the pressure on both gauges reads 35 kPa (5 psi).

- Wet the entire exterior of tank with soapy water solution. During freezing conditions a suitable anti-freeze (such as windshield washer fluid) may be added to the soap and water mixture.
- Inspect entire exterior surface of tank over 10- to 20-minute period for the formation of bubbles which would indicate a leak. **Do not leave pressurized tanks unattended.**
- After completion of test, release air pressure. Disconnect and remove manifold hose test kit and replace vent plugs in the primary tank and monitor well.

Should a leak be detected, **do not attempt repairs.** Contact your **ZCL** Representative for further instructions.



D. Leak Test for Hydrostatically Monitored Double Wall Prezerver Tanks with Annular Space Filled.

This tank has a hydrostatic monitoring system that includes a factory-installed, non toxic monitoring fluid in the annular space between the inner and outer walls. The monitoring fluid is a brine solution (30% calcium chloride). In the unlikely event of a tank leak, this fluid will leave a visible trace on the tank.

Reservoir Level Check

Remove the 100 mm (4 inch) plug from the reservoir fitting and inspect for presence of monitoring fluid. If the reservoir is empty, contact your **ZCL** Representative.

Primary Tank Test – Outer Wall Inspection

- Position tanks on flat level surface free of rocks or debris. If necessary, use suitable protection pads to roll tanks.
- Tighten any loose fitting plugs connected to the reservoir or to the annular space to avoid leakage

of monitoring fluid.

- Inspect entire exterior surface of tank for any trace of monitoring fluid. If any leak is observed as indicated by the presence of monitoring fluid, **do not attempt repairs.** Contact your **ZCL** Representative immediately.
- Connect air supply to a manway fitting or other convenient fitting leading directly to the primary tank. Pressurize the primary tank to 35 kPa (5 psi) **maximum** and hold.



CAUTION

Never attempt to pressurize a liquid-filled annular space or tank damage may result.

- Apply soapy water solution and soap all tank fittings, manways, flanged nozzles and covers, etc. If leaks are observed, as indicated by bubbles, tighten plugs or bolts and retest.

Primary Tank Visual Inspection

Release air pressure from primary tank. Remove a primary tank fitting plug from each end of tank. Conduct visual inspection of interior or primary tank and observe for any accumulation of monitoring fluid at the bottom of the tank.

Confirm that any liquid found is monitoring fluid (brine) or condensation (water).

If presence of monitoring fluid is detected, **do not attempt repairs.** Contact your **ZCL** Representative immediately. Replace and tighten plugs.

E. Compartment Tanks

- The double wall bulkhead in the Prezerver Compartment Tank is constructed to be interconnected with the annular space between the two tank walls.
- The bulkhead in Greentank Single Wall Compartment Tanks is also double wall. It is not necessary to conduct a pressure test if the bulkhead is shipped under vacuum or is brine filled. If testing of the bulkhead of single wall compartment tanks is required, connect and transfer air pressure from the primary tank via the monitor well fitting.

Do not connect air supply from a compressor directly to the monitor well fitting.

Section 3 Pre-Installation Testing (continued)

F. Special Test Instructions for Dry Monitored, Double Wall Prezerver Tanks Shipped with Vacuum Monitored Annular Space.

ZCL dry monitored double wall Prezerver tanks are shipped to the job site with a vacuum held on the annular space. This feature serves to confirm the integrity of the primary and secondary (outer) walls prior to shipment, during shipment and subsequent offloading and handling.

It should be noted that the reliability and accuracy of vacuum monitoring is only meaningful after an extensive period of time. When ZCL tanks have completed their final inspection at the plant, a label is affixed to the tank (adjacent to the gauge), showing the **original date** and level of vacuum held on the annular space. At the time of shipment, the vacuum level is checked again and recorded on the **packing slip**. The vacuum level at the time of shipment will generally be in the range of 18 to 21 in. Hg (Inches of mercury).

1. Upon arrival of the tank(s) at the job-site, the contractor must record the date and carefully observe and record the vacuum level on the gauge. This should preferably be done while the tank is still on the truck or immediately after off loading.
2. If the planned, tank installation date is **7 days or less** from the time of the original date shown on the tank label, or if the vacuum level on the gauge has **dropped more than 2 in. Hg** from the level recorded on the packing slip, ZCL requires that the vacuum on the annular space be released and that the Air Leakage Test (Primary Tank) and the Soap Bubble Test (Secondary Tank) **must be conducted** as per Section 3C of the Installation Instructions, prior to commencement of installation and backfilling.
3. If the time duration of the planned installation verifies that the tank has been **held under vacuum**

for 8 days or more from the original date, and the vacuum level has **not dropped more than 2 in. Hg** from the level recorded on the packing slip, the Soap Bubble Test of the secondary tank can be omitted and the tank can be installed directly in the excavation with the vacuum still held on the annular space.

4. Proceed with the installation in accordance with the ZCL Installation Instructions.
5. If the tank is required to be anchored, the vacuum reading should again be checked following the installation and tightening of the hold down straps.
6. When the backfilling has been completed to the top of the tank, confirm and record the final vacuum reading on the gauge.
7. Release vacuum from the tank annular space and then conduct the Air Leakage Test (Primary Tank) in accordance with Section 3C of the Installation Instructions and soap test all tank fittings and manways etc. **For tanks shipped with the vacuum gauge installed on the 1" annular vent fitting, the gauge, valve and elbow must be removed at this time and the 1" annular fitting sealed with the plug provided.**

NOTE: If high water table conditions in the excavation require the tank to be ballasted with product, the above Air Leakage and soap test of fittings **must be conducted above ground prior to installation and backfilling the tank.**



CAUTION

It is not permissible under any circumstances to put product in the tanks before completion and passing of all the pre-installation testing.

Section 4 Backfill Specifications

A. Primary Backfill Specification

All **ZCL** Tanks must be installed with Primary Backfill **only** within the region immediately surrounding the tanks. This Primary Backfill must extend a **minimum** of 45 cm (18 inches), (60 cm (24 inches) preferred) outward from the tank sides and ends, excepting directly beneath the tank where the backfill may be reduced to 30 cm (12 inches). The following materials are approved as Primary Backfill:

Pea Gravel (See Exhibit A – page 19)

Naturally rounded aggregate with particle size not less than 3 mm (1/8 inch) and not greater than 18 mm (3/4 inch). Gravel shall be clean and free flowing, free from large rocks, dirt, sand, roots, organic materials or debris. Upon screening analysis the backfill material shall have no more than 3% by weight passing #8 Sieve (2.38 mm (0.094 inches) screen opening).

Section 4 Backfill Specifications (continued)

Crushed Stone (See Exhibit B – page 20)

Crushed stone or gravel with particle size not less than 3 mm ($\frac{1}{8}$ inch) and not greater than 12 mm ($\frac{1}{2}$ inch). Aggregate shall be clean and free flowing, free from large rocks, dirt, sand, roots, organic materials or debris. Material should be washed or screened to remove fine particles. Upon screening analysis the backfill material shall have no more than 3% by weight passing #8 Sieve (2.38 mm (0.094 inches) screen opening).

NOTE: If backfill materials which meet the ZCL specifications are not available, contact your ZCL Sales Representative for information on approved alternate materials and installation instructions. **Use of other than specified backfill and bedding materials without prior written approval of ZCL will void the tank warranty.**

NOTE: All backfill material shall be free of ice and snow at time of installation. Backfill material shall not be frozen or contain lumps of frozen material at any time during placement.

B. Secondary Backfill Specification

Secondary Backfill may be used only at a distance from the tank walls. No Secondary Backfill may be placed closer than 1 meter (3 feet), or $\frac{1}{2}$ tank diameter, (whichever is lesser), from sides of any tank. Secondary Backfill may be used at more than 45 cm (18 inches) above any tank. The following are approved as Secondary Backfill materials:

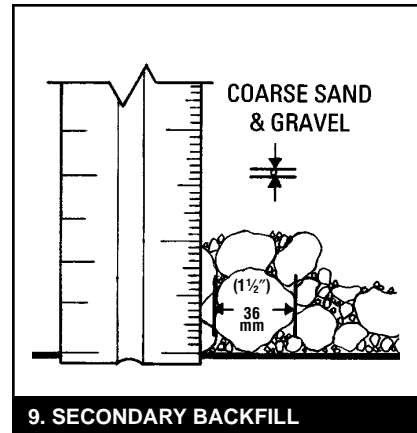
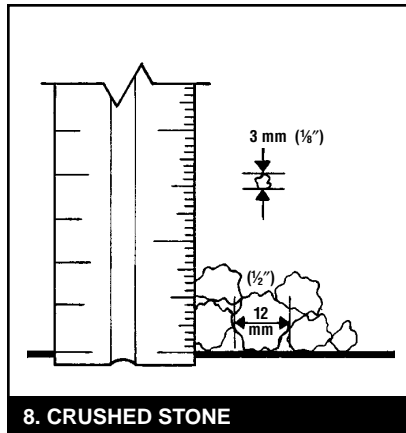
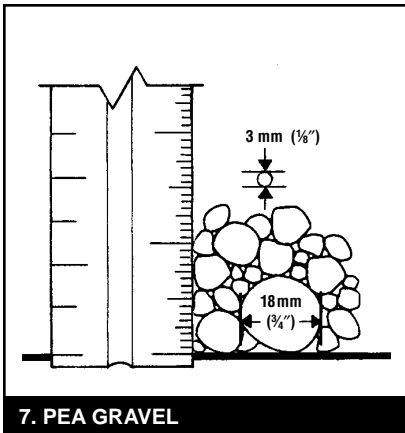
Coarse Sand or Gravel

Coarse sand or gravel containing rocks no larger than 36 mm ($1\frac{1}{2}$ inches) on largest dimension. Backfill shall be clean and free flowing, free from dirt, clay, fine sand, roots, organic materials or debris. Upon screening analysis this backfill material shall have no more than 5% by weight passing #200 Sieve. During placement this backfill material must be compacted to 95% Relative Compaction (as measured by the ASTM D1557 Procedure).

Select Native Backfill

Clean native backfill, or clean selected backfill, containing rocks no larger than 36 mm ($1\frac{1}{2}$ inches) on largest dimension. This material must be compacted to 95% Relative Compaction (as measured by ASTM D1557 Procedure). The quality of this backfill material shall be such that it exhibits an ultimate bearing strength in excess of 170 kPa (3500 lbs per square foot) in the compacted state. **Select native backfill may be used only at the perimeter of the excavation. Select native backfill cannot be used over tanks.**

NOTE: The use of geotextile barrier fabrics surrounding the Primary Backfill material is considered good installation practice. The fabric must be chosen to allow the flow of water in and out of the excavation but to prevent the movement of fine soil particles into the Primary Backfill material.



See pages 19 & 20 – Standard Sizes of Aggregate

Section 5 Size of Excavation

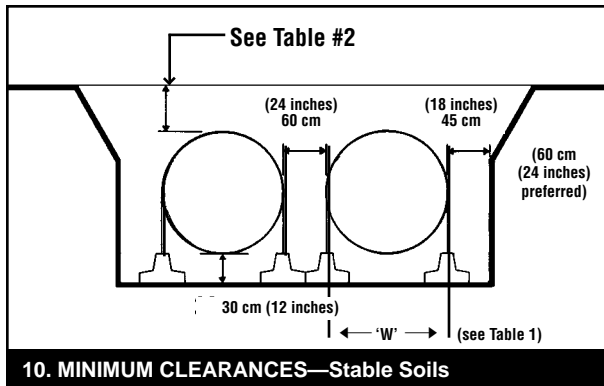
Minimum Clearances

For all ZCL Tank Models 40, 60 and 86 Series, the minimum allowable distances between the sides and ends of the tank and surrounding undisturbed soil shall be 45 cm (18 inches), (60 cm (24 inches) preferred) to allow for placement of initial backfill. For 100 Series Tanks the minimum recommended distance around sides and ends of tanks is 60 cm (24 inches). Minimum allowable distances between tanks shall be 60 cm (24 inches) or 90 cm (36 inches) for 10' tanks installed with deadman anchors. All measurements around the tank side walls are taken from the outside diameter of the reinforcing ribs.

NOTE: Municipal or Provincial regulations may apply.

Unstable Soils

Where soils are soft, bog, loose or likely to crack and crumble after the excavation, the clearances around the sides and ends of the tank will be affected by the back-slope requirements of the excavation. For such conditions the side walls must be backsloped to allow a minimum of 1/2 tank dia. from the end and sides of tank to the excavation walls (see diagram). The minimum clearances between tanks shall be as noted above. All loose material **must** be removed from the excavation prior to backfilling.



Depth of Excavation

The depth of the excavation is determined by:

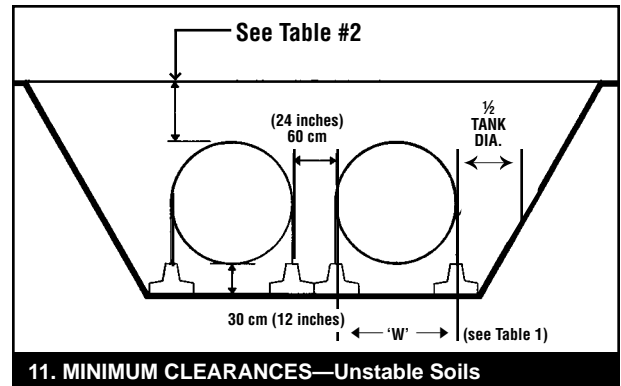
1. **Depth of bedding** (minimum 30 cm (12 inches) of Primary Backfill material) plus
2. **Diameter of tank** (refer to Specification Page for ZCL tank sizes and diameters) plus
3. **Backfill above tank** (as required by Federal or Provincial Fire Codes and regulations, and as recommended in Table #2 according to traffic and subsurface conditions).



WARNING

Maximum backfill depth for all ZCL Tank Models 40, 60, 86 and 100 Series is 215 cm (7 feet) to top of backfill or concrete pad if applicable.

NOTE: No additional depth of excavation is required for the use of the ZCL Tank Anchor System. If base of excavation is soft or uneven with difficult water conditions encountered, increase depth of bed and set anchors per Section 6 (4. Place Bedding).



Note: For 100 Series (10' dia.) tank installations with high water table conditions, requiring deadman anchors, spacing between tanks must be 90 cm (36 inches) minimum.

Table #1: 'W' – Center to Center Distance Between Anchors

Tank	'W'
Model 40 Series (4' dia.)	124.5 cm (4'-1½")
Model 60 Series (6' dia.)	193 cm (6'-4")
Model 86 Series (8' dia.)	259 cm (8'-6")
Model 100 Series (10' dia.)	349.25 cm (11'-5½")

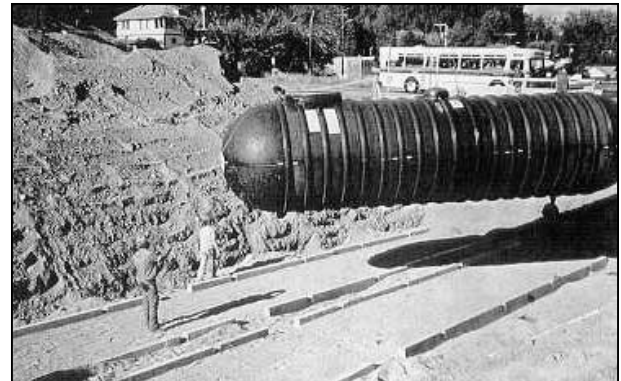


Table #2 Minimum Backfill Depth for ZCL Tank Models 40, 60, 86 and 100

Nominal Tank Dia.	Traffic Loads Over Tank	High Ground Water Table	Tank Anchoring System Used	*Minimum Total Depth of Cover Above Tank (cm (ins))
4, 6, 8 & 10 ft.	Yes	No	No	90 cm (36 ins.) backfill (See Note 3) or 75 cm (30 ins.) backfill + 15 cm (6 ins.) asphalt or 45 cm (18 ins.) backfill + 15 cm (6 ins.) reinf. concrete
4, 6, 8 & 10 ft.	No	No	No	60 cm (24 ins.) backfill or 30 cm (12 ins.) backfill + 10 cm (4 ins.) reinf. concrete
4 ft.	No	Yes	Yes	65 cm (26 ins.) backfill
4 ft.	Yes or No	Yes	No	90 cm (36 ins.) backfill or 70 cm (28 ins.) backfill + 15 cm (6 ins.) reinf. concrete
6 ft.	No	Yes	Yes	75 cm (30 ins.) backfill
6 ft.	Yes or No	Yes	No	130 cm (51 ins.) backfill or 110 cm (43 ins.) backfill + 15 cm (6 ins.) reinf. concrete
8 ft.	Yes or No	Yes	Yes	110 cm (43 ins.) backfill or 89 cm (35 ins.) backfill + 15 cm (6 ins.) reinf. concrete
8 ft.	Yes or No	Yes	No	155 cm (61 ins.) backfill or 135 cm (53 ins.) backfill + 15 cm (6 ins.) reinf. concrete
10 ft. (Less than 90,000 L)	Yes or No	Yes	Yes	110 cm (43 ins.) backfill or 89 cm (35 ins.) backfill + 15 cm (6 ins.) reinf. concrete
10 ft. (Less than 90,000 L)	Yes or No	Yes	No	198 cm (78 ins.) backfill or 178 cm (70 ins.) backfill + 15 cm (6 ins.) reinf. concrete
10 ft. (90,000 L and greater)	Yes or No	Yes	Yes	117 cm (46 ins.) backfill or 96 cm (38 ins.) backfill + 15 cm (6 ins.) reinf. concrete
10 ft. (90,000 L and greater)	Yes or No	Yes	No	208 cm (82 ins.) backfill or 188 cm (74 ins.) backfill + 15 cm (6 ins.) reinf. concrete

Notes:

- Locations are considered to have “high” water table if level of water in ground may rise above mid point of tank at any time.
- Information based on the use of **ZCL** Tank Anchor or equivalent.
- Traffic loads are assumed to be maximum loadings for highway vehicles (H-20). **ZCL** Tanks are designed to accommodate these traffic loads with minimum 90 cm (36 inches) Primary backfill above tanks, in accordance with requirements of ULC. If traffic conditions exist, however, **ZCL** strongly recommends the use of concrete or asphalt paving to **maintain** minimum cover depth requirements. Contact **ZCL** for additional instructions for sites subject to very heavy traffic such as off-highway vehicles, construction or agricultural equipment.

4. Do not reduce depth of backfill below minimum recommendations at any time when high water tables may exist at the tank site.

5. Asphalt and concrete pads at surface must extend a minimum of 30 cm (12 inches) beyond the tank in all directions.

NOTE: When asphalt paving is used, secondary backfill used at subgrade should be compacted with a vibrating plate mechanical compactor to prevent settlement. No truck or equipment loads are allowed over the tank unless backfill is at 36” prior to application of the asphalt, otherwise a light, non-vibrating roller should be used to compact the asphalt.

6. If asphalt paving is used in lieu of concrete, minimum total depth of cover provided must be the same as shown for the all backfill condition.

*7. Required depth of backfill to prevent upheaval under full flood conditions with water table to grade.

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

1. Prepare Excavation

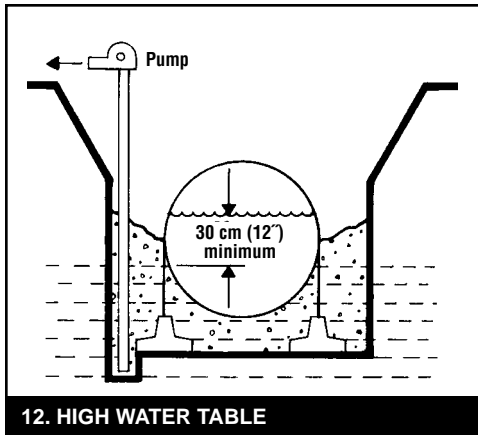
Prepare excavation according to required size and depth. Remove all loose soil. Level bottom of hole. Use Primary Backfill material (not soil) to fill low areas in excavation. If geotextile fabric is to be used around Primary Backfill, it should be placed in hole at this time.



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.

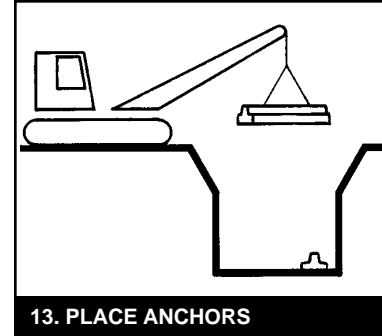


2. Tank Pre-Installation Test

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.



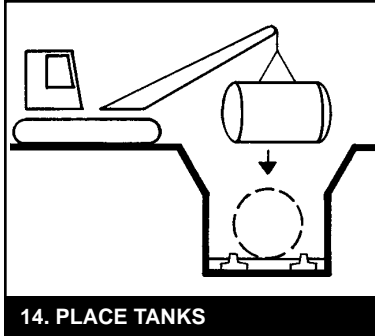
CAUTION

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

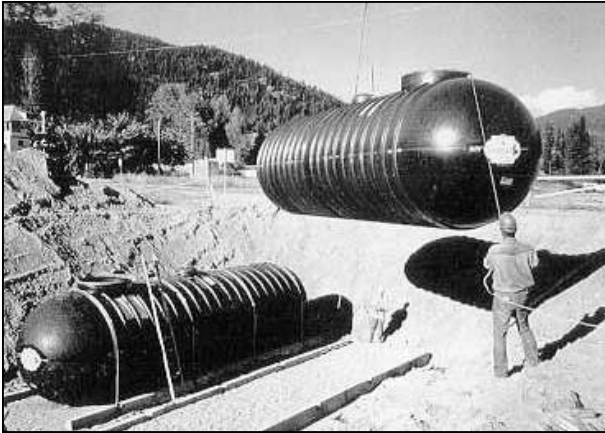
5. Place Tanks

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.

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



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.

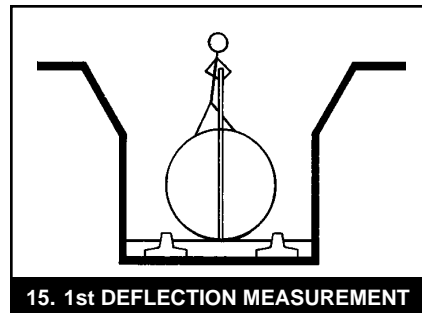
For **HIGH WATER TABLE CONDITIONS**, where it is not possible to maintain the water level below the top of the bed during the entire installation procedure, the tank must be placed using liquid ballast to firmly seat the tank into the bedding material and to keep the tank from floating. Position the 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

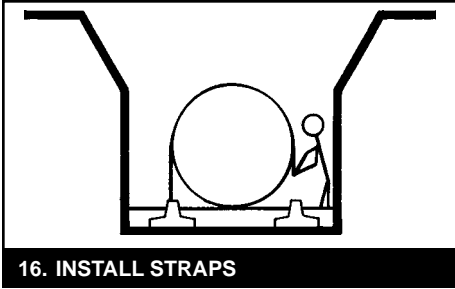
The Tie-Down Strap System consists of a corrosion-resistant fiberglass strap (with hook attachment on each end), three aluminum centering clips (for tanks with external ribs), and a turnbuckle (with eye on one end and hook on the other). For P-60 and P-86 models, position the three clips on the fiberglass 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.



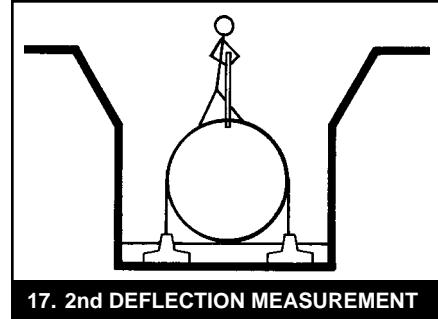
CAUTION

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

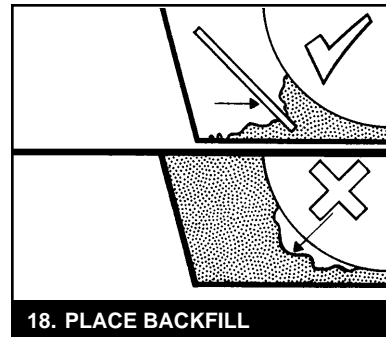


CAUTION

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.)



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

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.

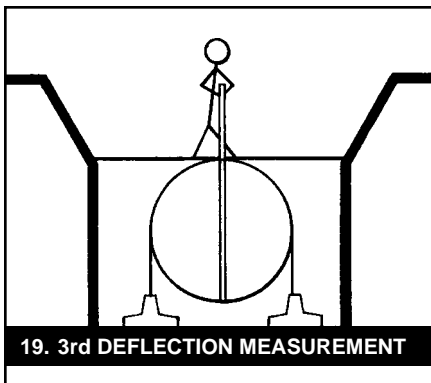
NOTE: If geotextile filter fabric is to be used in the installation, it must be placed between the Primary Backfill material and any surrounding soil or Secondary Backfill materials.

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

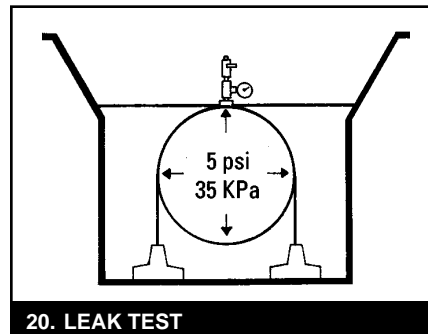
With backfill level with top of tank, measure and record distances at same fitting locations. (Record on page 16.) Calculate the differences between the First Reading and Third Reading for each tank and compare with the following chart. The installation is satisfactory if the differences in readings 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

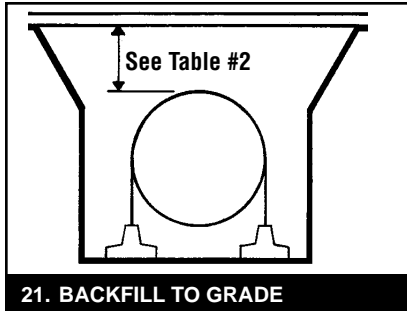
Maximum allowable test pressure on tank is 35 kPa (5 psi) at the top of the tank. **Do not** subject tank to vacuum. When not under test, tank must be vented at all times. If tanks have been ballasted with water, tanks may be air tested providing pressure at bottom of tank does not exceed 5 psi. **Do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

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

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.



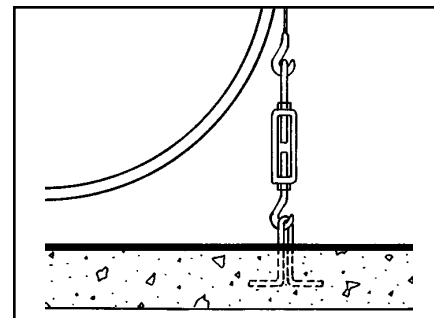
WARNING

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)



22. ALTERNATE ANCHORING SYSTEM

Section 8 Installing ZCL Tanks Without Anchor Systems

ZCL Tanks may be installed without the use of anchoring systems. For such installations the procedures of Section 6) shall be followed, except omitting the following paragraphs:

3. Place Tank Anchors
7. Install Tie Down Straps
8. Second Deflection Measurement

For Paragraph 10, Third Deflection Measurement, compare the differences between the First Reading and the Third Reading (now the Second) to the allowable values in Table #3 to determine a satisfactory installation.



WARNING

Tank installation must be designed to prevent upheaval due to subsurface water pressure (see Table #2 for minimum backfill requirements without anchors). Anchors are recommended at all sites where water level may rise above bottom of tank at any time during installation. Anchors are recommended for all sites where water table may rise to more than 1/2 tank diameter at any time during the service life of the tank. ZCL Warranty does not cover damage due to unanchored tanks under conditions where water could enter the excavation.

Section 9 Installation of Piping

All internal piping must end at least 10 cm (4 inches) from bottom of tank. Table #5 gives maximum allowable lengths for internal piping, measured from the top of the tank fitting.

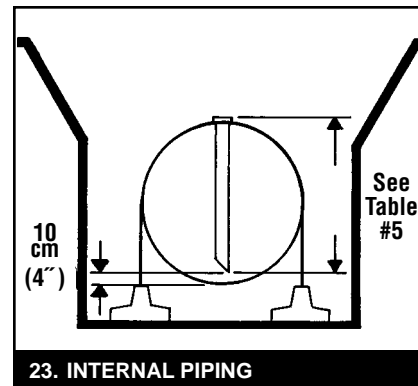
**Table #5
Maximum Length of Internal Piping**

Tank	Piping Length
Model 40 Series (4' dia)	109 cm (43 ins.)
Model 60 Series (6' dia)	170 cm (67 ins.)
Model 86 Series (8' dia)	241 cm (95 ins.)
Model 100 Series (10' dia)	297 cm (117 ins.)



WARNING

Tank must be isolated from piping system during pressure testing of piping. Maximum allowable pressure at top of tank is 35 kPa (5 psi). Tank pressure in excess of 35 kPa (5 psi) voids ZCL Warranty.



Section 10 Adding Tanks to Existing Installation

Precautions must be taken when adding tanks to existing sites. Backfill support around the existing tanks must not be disturbed. Use one of the following methods, according to site conditions:

Method 1 This method is preferred if space allows and existing tanks must remain in service during installation.

Install the new tank in a separate excavation, either adjacent or away from the original excavation. Follow the procedures outlined in these Installation Instructions.

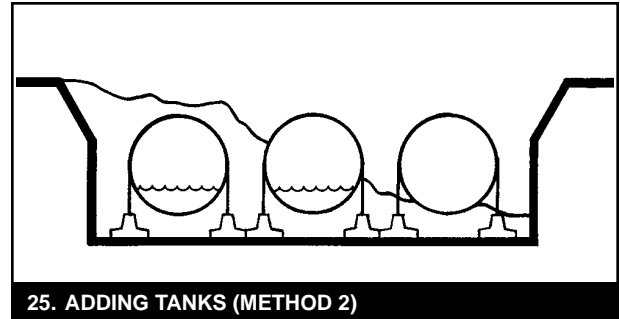
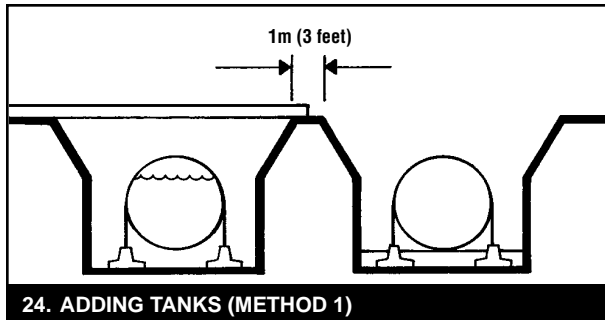
Sufficient soil must remain between the excavations that the backfill in the original excavation does not shift. Minimum separation between the old and new excavations will depend upon the strength of the soil; however, it should not be less than 1 meter (3 feet) at top of hole. Keep heavy surface loads off existing tanks if excavation is open.

Method 2 This method is used if it is necessary to install the new tank within the existing tank excavation.

Empty all tanks in existing excavation to between 1/3

Section 10 Adding Tanks to Existing Installation (continued)

and 1/4 capacity. Simultaneously enlarge the excavation and remove portion of the existing backfill material from hole. Slope carefully the existing backfill material such that it does not shift the existing tanks. Place and install the new tank according to these Installation Instructions, observing all spacing and backfill requirements.



WARNING

It may be necessary to install shoring to prevent the movement of existing tanks.



CAUTION

Should any existing tanks shift during the installation procedure, they must be removed and reinstalled according to manufacturer's instructions.

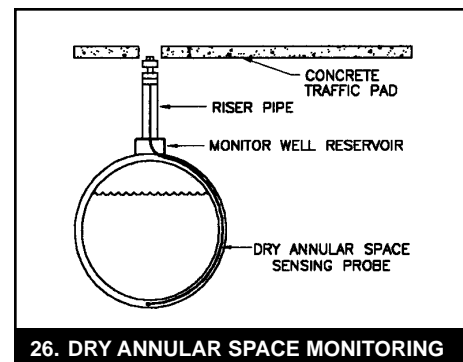
Section 11 Double Wall Tank Monitoring

The ZCL Double Wall Prezerver Tank Series are designed to accommodate a variety of continuous leak monitoring systems. The selection of the type of monitoring system is the responsibility of the tank owner and/or operator.

A. Dry Annular Space Monitoring

Liquid and vapor sensors are installed through the monitoring well reservoir, using the ZCL factory-installed draw string to facilitate positioning of the monitoring sensor at or near the bottom of the tank. Most sensors can be installed from finished grade; however, for ease of installation the sensor should be inserted into the monitoring well cavity **before installing the monitoring riser pipe to grade**.

The cavity space around the monitoring well rib is 25 mm (1 inch) wide or greater for all tank sizes. Consult monitoring equipment manufacturer's installation instructions for correct installation and wiring connection details. For liquid or vapor sensors, the monitoring well cavity may be vented to atmosphere (independent from the primary tank) or sealed.



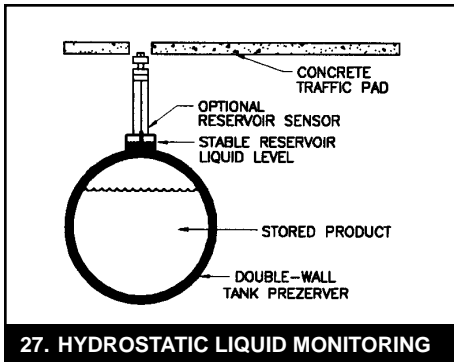
B. Hydrostatic Monitors

ZCL Double Wall Prezerver tanks up to and including 10' dia, 75,000 L capacity, ordered for Hydrostatic Monitoring systems are shipped with factory-installed monitoring fluid in the annular space. (Larger sizes may be shipped partially filled with brine, with the balance bulk shipped for top-off at the job site.) Prior to installation of the tank, check level of fluid in the monitoring well reservoir. The required operating level for the monitoring fluid is approximately 1/2 full. If necessary, fill to the 1/2 full level with the spare ZCL-supplied liquid brine solution

Section 11 Double Wall Tank Monitoring (continued)

shipped with the tank. **Do not overfill.** The annular space of hydrostatically monitored tanks must be vented.

The liquid level in the reservoir can be monitored periodically by using a dipstick. Where monitoring on a continuous basis is required, a choice of Reservoir Sensors and electronic control panels with appropriate installation instructions are available from **ZCL**.



C. Vacuum or Pressure Monitoring Systems

The **ZCL** Double Wall Preerver tanks are designed to accommodate continuous monitoring utilizing vacuum or air pressure systems. Consult **ZCL** for information on allowable vacuum or pressure operating levels.

D. Flexible Dipstick Monitoring

For tank installations where continuous monitoring is not mandatory, an optional flexible dipstick monitoring system which accesses the monitoring well cavity through a 10 cm (4 inch) dia. riser pipe is available from **ZCL**.

Section 12 Turbine Enclosure Sump and Collars

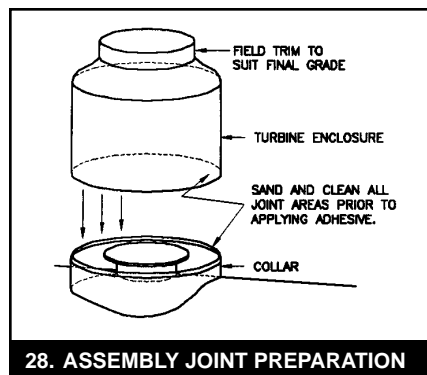
The **ZCL** fiberglass turbine enclosure sump provides a housing for a submersible pump and a termination point for double wall piping systems. The factory-installed secondary containment collar and contractor installed turbine enclosure sump (tank sump) provides containment for any leaks from the pump or piping connections and a location for a leak-monitoring sensor. **ZCL**'s standard Z48 model sump consists of a 1220 mm (48 inch) nominal dia housing, with an 816 mm (32 inch) or optional 990 mm (39 inch) dia access opening on top, complete with fiberglass cover. For high water table conditions a gasketed water-tight cover is available from **ZCL**.

A. Pre-Installation

Before installing the turbine enclosure sump, conduct a visual inspection for potential shipping damage. Wear gloves when handling and lifting and do not drop or roll the sump. Measure the sump to ensure it is the correct length for intended burial depth. The top end of the sump can be field trimmed to required length using a suitable carbide-tipped blade or masonry saw. Carefully mark out required location of cut line and trim evenly to a flat, smooth edge.

B. Mounting Turbine Enclosure Sump on Collar

Prior to mounting the turbine enclosure on the collar, if necessary, rotate manway cover to align tank fittings and location of submersible pump with intended piping layout. Whenever manway cover is removed, inspect gasket for damage and replace if necessary. The turbine enclosure should be cemented in place using the adhesive kit supplied by **ZCL** to prevent the ingress of water. This joint is not designed to continuously hold petroleum products:



Section 12 Turbine Enclosure Sump and Collars (continued)

Step #1 – Sand and Clean Mating Surfaces

Wipe the mating surfaces clean. Use the sandpaper supplied and sand the bottom 75 mm (3 inch) of the turbine enclosure interior surface and the outside surface of the tapered sleeve on the collar. All joint surfaces must be sanded until they are uniformly “white” in color.

Step #2 – Position Turbine Enclosure Sump on Collar

Position turbine enclosure onto the collar. Fit may be snug. If necessary, use a rubber mallet to seat evenly on collar. Before mixing or applying adhesive, ensure surfaces inside the adhesive channel are clean and dry.

Do not use water or gasoline to clean surfaces.

Step #3 – Mix and Apply Adhesive

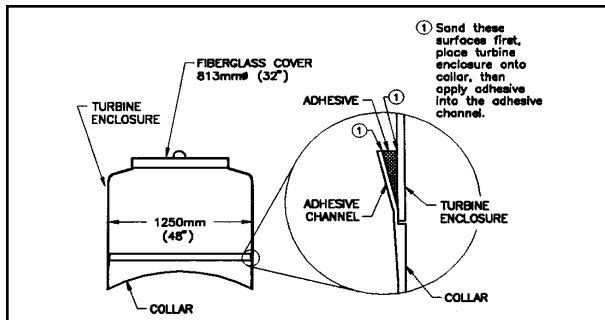
Thoroughly mix the two-part adhesive in accordance with detailed instructions supplied with the adhesive kit.



WARNING

Ensure recommendations for temperature conditions and safety requirements noted with instructions are carefully followed.

Apply adhesive with spatula or putty knife supplied, filling adhesive channel from inside the turbine enclosure. Adhesive should be applied before backfilling around turbine enclosure sump to enable visual exterior inspection during subsequent leak test.



29. APPLICATION OF JOINT ADHESIVE

Step #4 – Curing

Allow minimum 24 hours for adhesive to cure. Mating parts must not be allowed to move before adhesive is fully cured. For outside ambient temperatures below 15°C (60° F) supplemental heat is required to initiate cure. See adhesive application instructions supplied.

C. Piping Connections

Secondary piping or electrical conduit can be connected to the turbine enclosure using field-installed couplings or flexible rubber entry boots available from **ZCL** Distributors. Holes for connections through the wall of the fiberglass turbine enclosure must be carefully marked out to ensure correct alignment with intended piping layout.

Follow double wall pipe manufacturer’s installation instructions for correct size of hole saw for piping connections. Hole penetrations for piping connections should be aligned radially with the centre of the turbine enclosure and **must not** interfere with the adhesive joint to the collar.

D. Leak Test

Do not attempt to leak-test sump assembly with air pressure. **ZCL** requires a standing water test to verify leak tightness of the adhesive joint between collar and turbine enclosure. Fill turbine enclosure with water to 75 mm (3 inches) above the joint. Carefully record liquid level. After 24 hours remeasure and check level. A change in liquid level of more than 6 mm (1/4 inch) indicates a possible leak. (Visually check exterior for presence of water. If leak is found drain water and re-apply adhesive. (A standing water test can also be used to verify leak tightness of field-installed flexible entry boots on the turbine enclosure with level set 75 mm (3 inches) above fittings.)

Do not leave water in sump during winter conditions to avoid possibility of freeze damage.

E. Monitoring

The secondary containment collar must be continuously monitored for potential accumulation of any leaks with a field-installed electronic monitoring sensor. Optional containment collar sensors and factory-installed mounting brackets are available from **ZCL**.



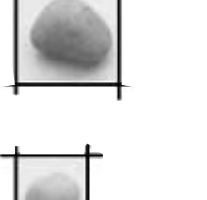

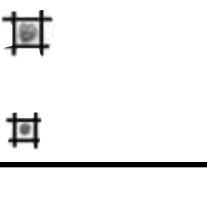
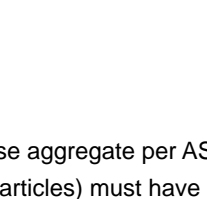
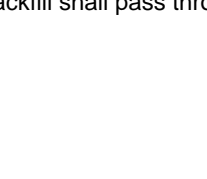
F. Top Clearances

The turbine enclosure sump assembly must be isolated from direct traffic loading. Use a suitably sized street box to provide access to the sump lid and ensure the clearance between the bottom of the concrete pad and the top of the turbine enclosure is a minimum of 50 mm (2 inches). For tanks located in traffic areas, concrete pad must be rebar reinforced to span under-

Exhibit A – Standard Sizes of Coarse Aggregate¹ that Meet ZCL Pea Gravel Specifications²

This table identifies standard sizes of coarse aggregate that meet **ZCL** pea gravel specifications. The first column identifies standard sieve sizes that are used to grade aggregate material. The remainder of the columns have a standard aggregate grade number at the top of the column.

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. These percentages give an indication of the particle size distribution or gradation within a given aggregate size. Using aggregate number 6 as an example, we can expect 20% to 55% of the sample (measured by weight) to pass through a 1/2 inch sieve.

Sieve Size		Aggregate Grade Numbers			
		6	67	7	
		Amounts finer than each laboratory sieve (Square Openings), weight percent			
		1 inch (25.4 mm)	100%	100%	—
Maximum →		3/4 inch (19.0 mm)	90–100%	90–100%	100%
		1/2 inch (12.7 mm)	20–55%	—	90–100%
		3/8 inch (9.5 mm)	0–15%	20–55%	40–70%
		No. 4 (0.187 in.) (4.8 mm)	0–5%	0–10%	0–15%
→ Minimum		1/8 inch (3.2 mm)	—	—	—
		No. 8 (0.094 in.) (2.4 mm)	0–3%	0–3%	0–3%






NOTES:

- Standard sizes of coarse aggregate per ASTM-D-448, ASTM C-33 and AASHTO M 43.
- Pea Gravel (rounded particles) must have a minimum diameter of 1/8 inch and a maximum diameter of 3/4 inch. No more than 3% of the backfill shall pass through a No. 8 sieve.

Exhibit B – Standard Sizes of Coarse Aggregate¹ that Meet ZCL Crushed Stone Specifications²

This table identifies standard sizes of coarse aggregate that meet **ZCL** crushed stone specifications. The first column identifies standard sieve sizes that are used to grade aggregate material. The remainder of the columns have a standard aggregate size number at the top of the column.

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. These percentages give an indication of the particle size distribution or gradation within a given aggregate size. Using aggregate number 7 as an example, we can expect 0% to 15% of the sample (measured by weight) to pass through a No. 4 sieve.

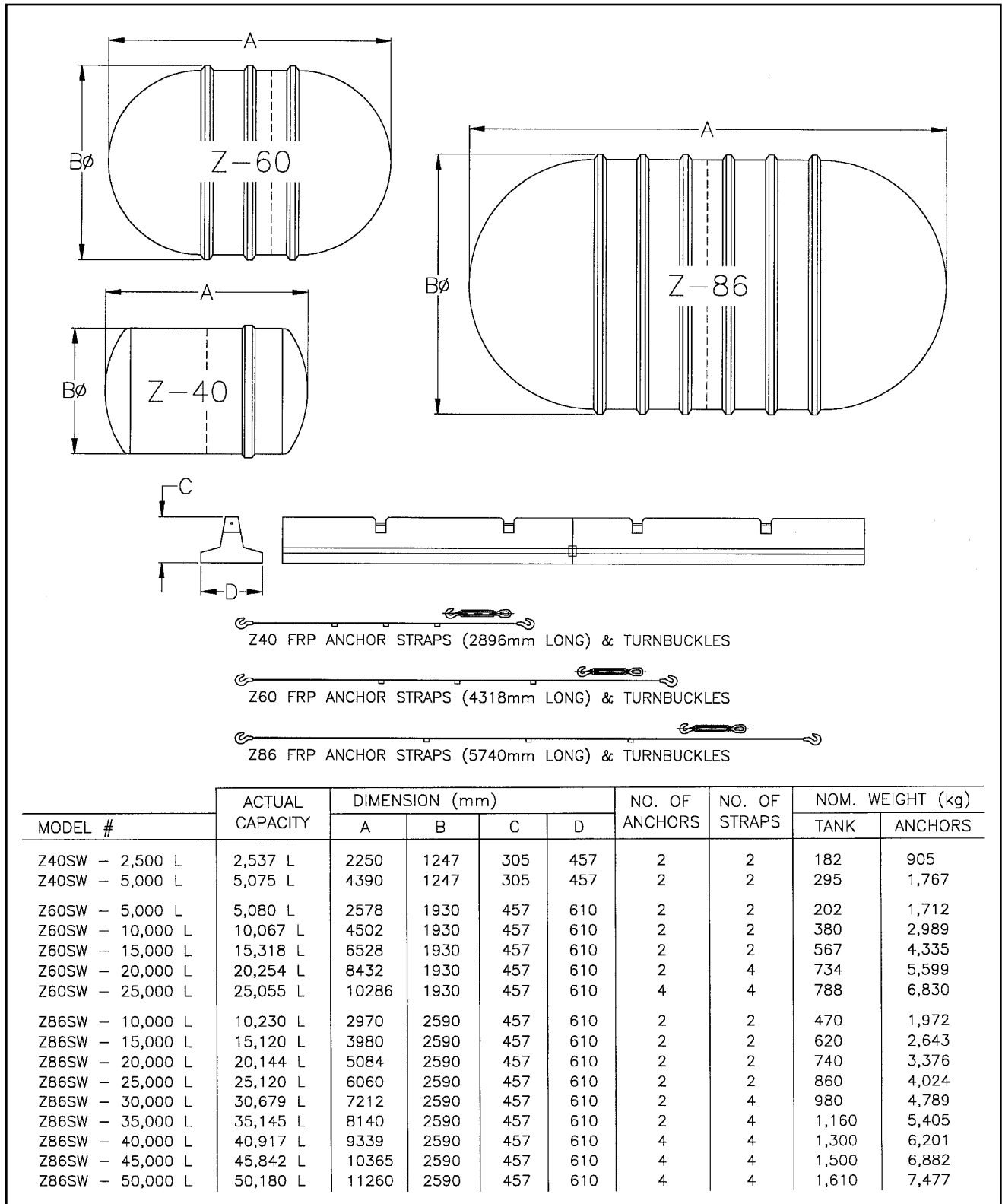
Sieve Size		Aggregate Grade Numbers	
		7	8
		Amounts finer than each laboratory sieve (Square Openings), weight percent	
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 10px;">Maximum →</div> <div style="margin-bottom: 10px;"></div> <div style="margin-bottom: 10px;"></div> <div style="margin-bottom: 10px;"></div> <div style="margin-bottom: 10px;"></div> <div style="margin-bottom: 10px;"></div> <div style="margin-bottom: 10px;">→ Minimum</div> </div>	1 inch (25.4 mm)	—	—
	3/4 inch (19.0 mm)	100%	—
	1/2 inch (12.7 mm)	90–100%	100%
	3/8 inch (9.5 mm)	40–70%	85–100%
	No. 4 (0.187 in.) (4.8 mm)	0–15%	10–30%
	1/8 inch (3.2 mm)	—	—
	No. 8 (0.094 in.) (2.4 mm)	0–3%	0–3%

NOTES:

1. Standard sizes of coarse aggregate per ASTM-D-448, ASTM C-33 and AASHTO M 43.
2. STONE CRUSHINGS should be washed and free flowing. Angular particle size should be between 1/8 inch and 1/2 inch and must meet ASTM C-33 paragraph 9.1 requirements. No more than 3% of the backfill shall pass through a No. 8 sieve.

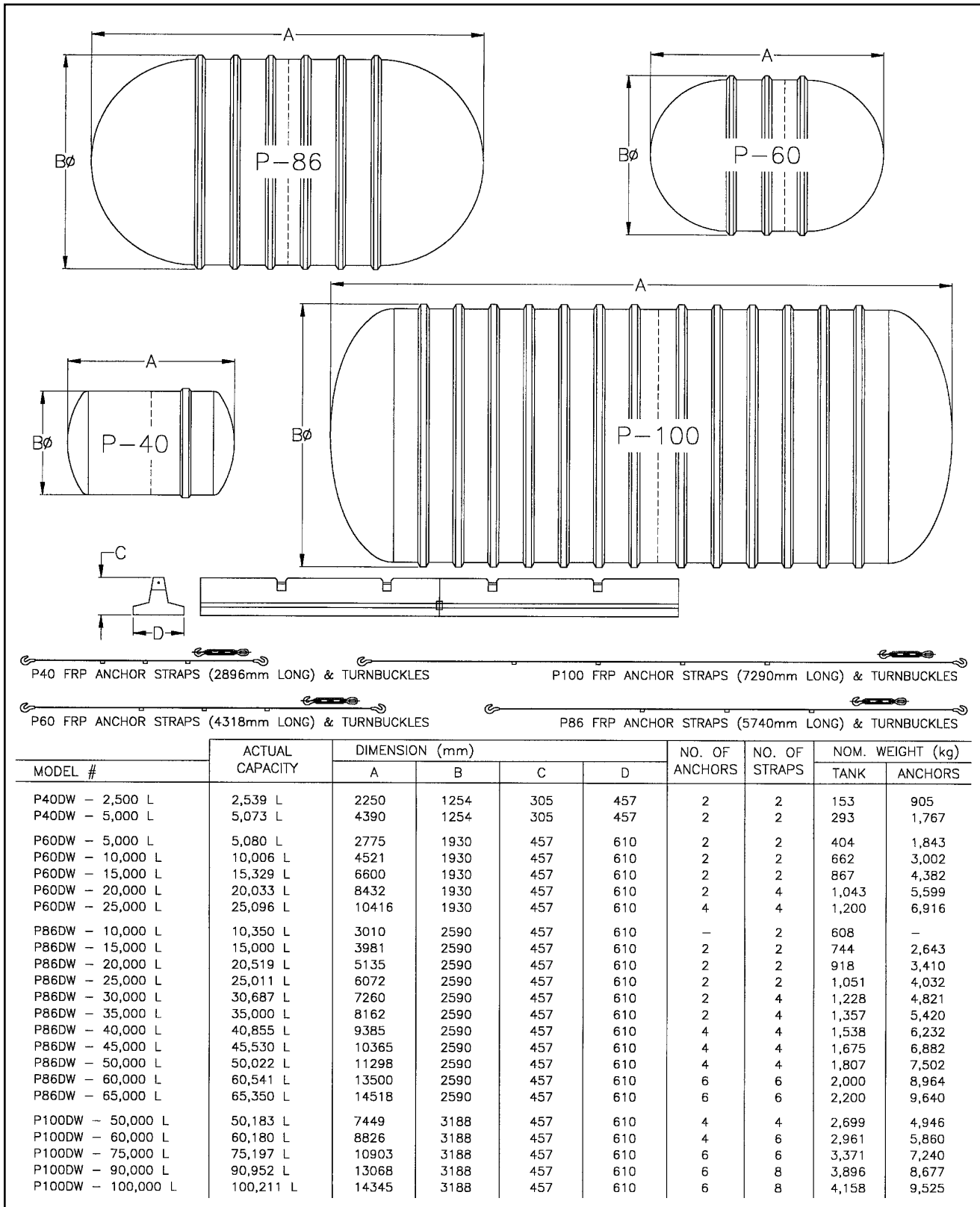
ZCL "Greentank" Specification Sheet

For Z-40, Z-60, and Z-86 Series Single Wall Tanks with ZCL Tank Anchors



ZCL "PreZerver" Specification Sheet

For P-40, P-60 and P-86 Series Double Wall Tanks with ZCL Tank Anchors



ZCL

Fiberglass Underground Storage Tanks Installation Checklist and Inspection Report

This checklist report must be completed in its entirety by tank owner or its representative at installation site and returned to:

ZCL Composites Inc., 6907 - 36 Street, Edmonton, AB T6B 2Z6

The Tank owner must retain a copy of this checklist and all deviation authorization letters in order to substantiate any warranty claims.

Site Location: Address		
City	Prov.	Tel. #
Owner		Contractor
Address		Address
Telephone #		Telephone #
Name		Name

Completion of this form is necessary to validate the ZCL Tank Warranty

	Tank #1	Tank #2	Tank #3	Tank #4	Tank #5
Tank Type: <input type="checkbox"/> SWT <input type="checkbox"/> DWT <input type="checkbox"/> MCT <input type="checkbox"/> OWS <input type="checkbox"/> Other (Check those that apply.)					
Volume <input type="checkbox"/> litre <input type="checkbox"/> gal.					
U.L.C. # (from label on tank)					
Pre-Installation Inspection					
Evidence of Visual Damage (Yes or No) Describe below.					
For tanks shipped under vacuum, record gauge reading (in. Hg) upon arrival per section 3F.					
Tanks Leak Tested per ZCL Instructions					
Evidence of leak under Leak Test (Yes or No) Describe below.					
Deflection Measurements					
Measurement #1 (as received)					
Measurement #2 (straps installed)					
Measurement #3 (backfill to top of tank)					
Calculated Deflection as per Sect. 6 (cm or ins.) (Difference between Measurement #1 & #3)					
Installation Information					
Depth of Bedding (under tank)					
Minimum spacing used between tanks					
Minimum clearance used between sides and ends of tanks and walls of excavation.					
Were backfill layers pushed and probed under tanks between ribs and under endcaps to eliminate voids?					
If Secondary Backfill used, was material compacted per ZCL Installation Instructions?					
If water conditions in the hole, were tanks ballasted per Installation Instructions?					
Was a filter fabric used at this installation?					
Was backfill completed in uniform lifts?					
Specify final depth of Backfill (over tank)					
Level of backfill @ termination of inspection.					
Type and thickness of Surface Pad.					

Descriptions

Site Information

Native Soil

- Soil Type
 Hard
 Medium
 Soft
 Rock
 Stable Walls
 Crumbling Walls
 Unstable Walls

Drainage

- Well Drained
 Moderate Drainage
 Poor Drainage

Water Table

- Not Found
 Present @ ____ cm or ins below grade
 Pumps used Yes No

Backfill

Primary Backfill

- Pea Gravel
 Crushed Stone
 Meets Specifications Yes No
 (if No, describe below)

Secondary Backfill

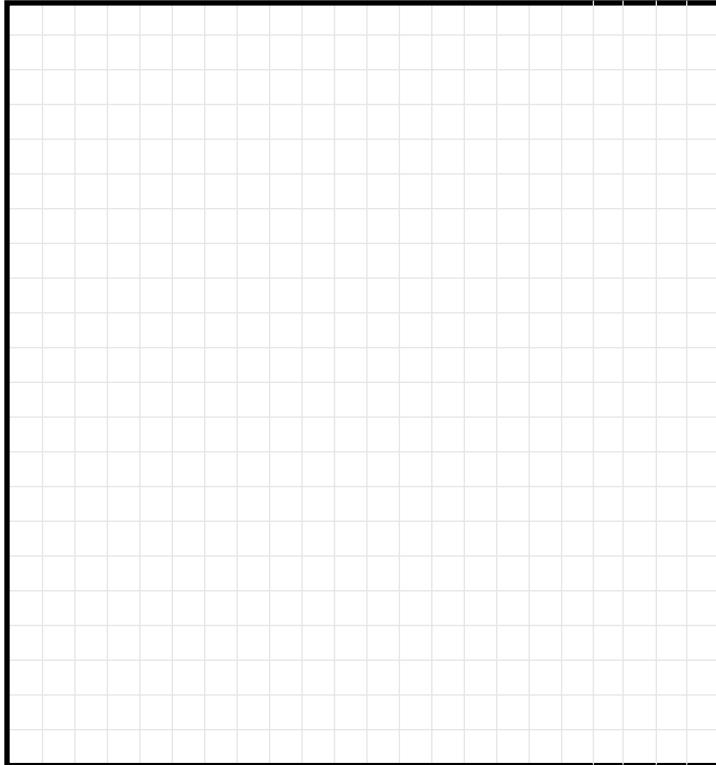
- Gravel
 Coarse Sand
 Native Soil
 Other _____

Meets Specifications? Yes No
 (if No, requires an Authorization Letter)

Anchoring System

- ZCL Tank Anchor
 Concrete Slab under tank
 Deadman
 Other (requires an Authorization Letter) _____

ZCL Straps and Anchoring Loops used



Provide sketch of site in above space. Show locations and orientations of tanks relative to permanent landmarks. Identify tanks by ULC numbers. Indicate "North" direction. Indicate locations of any secondary backfill materials. Note unusual site conditions.

Installation Procedure

Procedures as per Installation Instructions, except as noted below: _____

In order to better serve you, would you please fill out our survey.

- Did these tanks arrive on time? Yes No
 Were there any quality issues with the tanks? Yes No
 Was ZCL service satisfactory? Yes No

I CERTIFY THIS TO BE A TRUE RECORD OF THE INSTALLATION OF THE ABOVE TANKS AT THE LOCATION IDENTIFIED HEREIN: _____ DATE _____		
Name: Owner's Representative	Name: Contractor's Representative	Name: ZCL Representative (if present)
Signature	Signature	Signature



Canada's #1 fiberglass
tank manufacturer.

ZCL
COMPOSITES INC.



Technical Support
Field Service
Customer Service

Toll Free: 1-800-661-8265

www.zcl.com



PREZERVER™

