

GUIDELINE SPECIFICATIONS

FRP Double Wall Tanks for Fuel Storage

The contractor shall provide double wall Fiberglass Reinforced Plastic (FRP) Underwriters Laboratories labeled underground storage tanks as shown on the drawings. Sizes and fittings shall be as shown. The tanks shall be fiberglass tanks as manufactured by ZCL Composites Inc.

Tanks shall be tested and installed with pea gravel or crushed stone as specified in the current installation instructions provided with the tank. Fibreglass reinforced plastic (FRP) underground storage tanks of double wall construction for fuel storage

Part 1: General

1.01 Quality Assurance

A. Acceptable Manufacturer:

1. FRP Tanks: ZCL Composites Inc.
2. Anchoring Systems: ZCL Composites Inc.

B. Governing Standards: Underwriters' Laboratories of Canada (ULC) File Can4-S615-M85, Standard for Reinforced Plastics Underground Storage Tanks for Petroleum Products. The manufacturer shall complete and hold on record such Quality Assurance documentation as may be required by the above Standard.

C. Certification: Each tank shall be manufactured to ULC Specifications and a ULC Certification Plate shall be required.

1.02 Submittals

- A. The Contractor shall submit copies ____ of drawings for each tank. Drawing shall show locations of all fittings, accessories, hold down points, and critical dimensions.
- B. The Contractor shall submit ____copies of Gauge Chart for each tank indicating contained volume (in litres) of each tank for each half centimetre of depth of contained liquid. Gauge Charts shall be based on actual tank capacity and shall be accurate within 0.1% of tank volume

Part 2: Products

2.01 Fibreglass Reinforced Plastic (FRP) Underground Storage Tank(s)

A. Design

1. Tank(s) shall be Double Wall Construction.
2. Tank(s) shall be capable of burial up to 2.1 metres (7ft.) to top of tank.
3. Tank(s) shall have integrally moulded ribs for reinforcement of tank walls against pressures due to soil and high water table.
4. Tank(s) may be of multiple compartment design. Internal bulkheads shall be hemispherical shaped to resist deflection and breakage due to internal liquid levels.
5. Tank shall be constructed of such materials, and by such process, that they shall not break, collapse or corrode due to the exposure to ambient soil or water or designated contents of tank as stated in the purchase documents, for a period of one (1) year from the date of installation.

B. Loading Conditions

1. When installed according to the manufacturer's instructions, the tank(s) shall meet the following design conditions:
 - a) The tank will withstand external loads due to soil and water table with a 3:1 safety Factor against failure and without deflection beyond manufacturer's recommended limits. Such loading shall be considered with tank empty of all liquid and external water levels at surface of backfill.
 - b) Tank(s) shall withstand surface H-20 axle loading of any position over the tank without failure or deflection beyond manufacturer's recommended limits.
 - c) Tank(s) shall resist continuous uplifting forces due to ground water pressure without rising or deflection beyond manufacturer's recommended limits. Such loading shall be considered with tank empty of all liquid and external water level at surface of backfill.

C. Testing

1. Each tank, or tank compartment, shall be tested by manufacturer with 35kPA (5psi) internal pressure. During pressure test, the exterior of the tank shall be tested to be free of leaks with soapy water solution.
2. Each tank shall be designed such that it is capable of being subjected to a Precision Leak Test after installation.

D. Pressure Rating

1. Except while being tested in accordance to the manufacturer's Installation Instructions, or other methods approved by the manufacturer, the tank(s) shall not be subject to pressure or vacuum in excess of the values indicated. Tank(s) shall be vented at all times.

E. Product Storage

1. Tank(s) shall be capable of storing liquids with specific gravity up to 1.1.
2. Contact ZCL's Engineering Department or Customer Service Representative for information on allowable product storage.

2.02 Anchoring System

A. Design

1. Anchors shall be of "deadman" type designed for placement on each side of the tank on the bottom of the tank excavation.
2. Anchors shall be designed with attachment points corresponding to designated anchorage positions of tank(s).
3. Anchors shall have a total overall length equal to the tanks to which they are attached.
4. Tank(s) shall be attached to anchors by means of non-corroding straps which extend between anchors and over the tanks at designated positions. Straps shall attach to anchors by means of hooks. Each strap shall be capable of being adjusted for snug fit by means of a turnbuckle.
5. Anchors shall be "inverted T" cross sectional profile for maximum load carrying capability.
6. Anchor System shall be designed to distribute loading equally between designated anchoring points on tank
7. Anchoring system shall not interfere with the backfill beneath tanks.

B. Loading Conditions

1. When installed according to manufacturer's instructions, Anchoring System shall be capable of withstanding continuously the uplift forces caused by ground water pressure. Such loading shall be considered with the tank empty of all liquid and external water levels at surface of backfill.
2. Each component of the Anchoring System shall have a factor of safety of a minimum of 2.1 against failure under the most severe loading condition. Such loading shall be considered with tank empty of all liquid and external water level at surface of backfill.

C. Materials

1. Anchors shall be constructed from 25 MPa minimum strength, Type 50 concrete reinforced internally with steel reinforcing bar. All internal reinforcement is to be cross-tied to prevent pullout of hold down points. All exposed reinforcing steel is to be corrosion protected with bonded epoxy coating.
2. Straps to be fabricated from unidirectional fiberglass material and epoxy by process of pultrusion. Strap shall have a minimum of 75% by weight glass content, be uniform in glass distribution and in cross section. Metallic components shall be cast nodular iron with galvanized coating. Bonding of metallic components to strap shall be by epoxy system. Straps shall be provided with alignment clips to hold strap in designated location on tanks.
3. Turnbuckles shall be of steel construction with galvanized coating. Turnbuckle shall bear manufacturer's making symbol for component trace ability.

D. Testing and Certification

1. Each strap assembly shall be proof tested by the manufacturer to a minimum 150% of design load. Manufacturer shall supply engineered design calculations demonstrating that the anchoring system shall provide the necessary hold-down force for the design conditions stated in 1.02-B1

2.03 Standard Accessories

The following accessories shall be provided with each tank:

- A. Two (2) lift-lugs straddling centerline of tank. Lift-lugs shall be designed to carry four (4) times empty weight of tank.
- B. Gauge Chart with headings at 1/2cm intervals.
- C. Calibrated Dip Stick at 1/2 cm intervals.
- D. Installation Instructions for all above components, including instructions for wet and dry hole installation, and procedures for installation of Anchor Systems.

2.04 Optional Accessories

Where indicated on the drawings, the tank(s) may be supplied with the following Optional Accessories:

- A. 4" or 6" NPT threaded style fittings at locations shown on drawings.
- B. FRP Flanged Nozzle, 50 psi, 150# ANSI (drilling) in the appropriate size at location shown on drawings.
- C. Steel Pipe Stub (nipple) of appropriate size and schedule at locations as shown on drawings. **Note:** A companion flange may be supplied as required.

- D. Anchoring System consisting of pre-cast reinforced concrete “deadman” components, complete with an appropriate number of straps and turnbuckles as indicated on the drawings.
- E. FRP Riser Assembly (turbine enclosure) of the appropriate size may be supplied to be installed at the location shown on the tank drawings.