



TRICEL
WATER STORAGE

Underground tanks

Installation manual

Quality tanks since 1973



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It is important to read the full technical and installation guide prior to installation. This document should be retained for the lifetime of the product and in the event of change of ownership be transferred to the new owner.

Health and safety precautions:

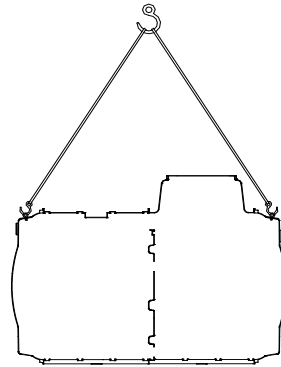
As safety and security are of vital importance in installation, the following aspects are critical.

- Ensure that all the information contained in this manual is adhered to at all times
- All electrical work to be carried out by competent persons using suitable materials for the application.
- Isolate the mains power prior to maintenance
- Electrical work must be carried out strictly to the manufacturer's instructions and to the relevant national rules for electrical installations.
- When working with machinery / electrical equipment, proximity of water shall be noted.
- Equipment shall not be wet when working with it.
- There is potential danger if de-sludging and therefore this shall never be done alone.
- Never enter a tank unless qualified to do so.
- Naked flames shall not be used in the vicinity of the tank due to the danger of combustion.
- The manhole covers shall never be left off an unattended tank.
- Protective clothing / gloves shall be worn at all times. Always remove contaminated clothing and protective equipment after working with sewage treatment systems.
- Wash hands and face prior to eating, drinking or smoking.
- A second person shall be present when carrying out maintenance.
- Great care shall be taken if handling sludge.
- Always lock the cover of the system when maintenance is completed.

Transportation, unloading and storage of tanks:

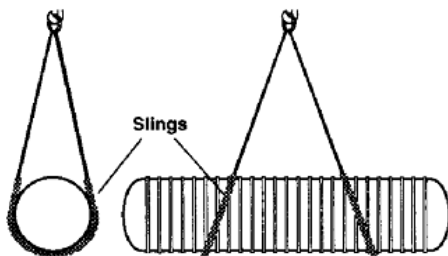
Transportation, unloading Tanks must be held down during transportation using nylon straps, do not use cables or chains to secure tanks. Do not over tighten straps to cause deformation of the tank shell

2. Always set the tank(s) on flat smooth ground free from debris etc. To prevent movement, tanks may need to be tied down and chocked.
3. Tanks are best lifted by crane and webbing lifting straps – do not use chains or wire ropes in contact with the tank. Ensure tank is empty when lifting.
4. Tanks up to 6m in length should be lifted using the eyebolts that come with the tank*.

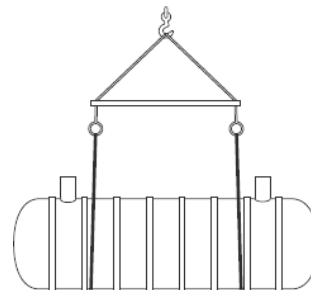


5. Tanks over 6m long should be lifted using slings
6. We recommend the use of a lifting beam for tanks longer than 8 meters.

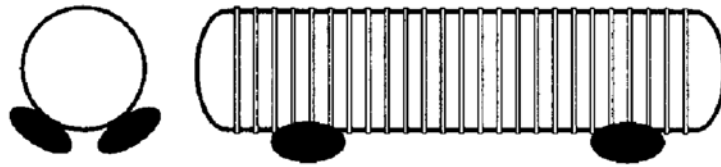
Use slings for tanks over 6m long



Tanks over 8m long, use a lifting beam



7. Smaller tanks may be lifted with other suitable site equipment but greater care is needed to control the lift and to ensure the tank is not damaged.
8. Move tanks only by lifting and setting, do not drag or roll
9. Do not drop or roll tanks from truck



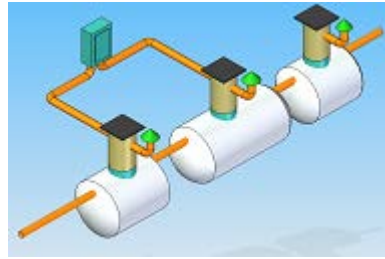
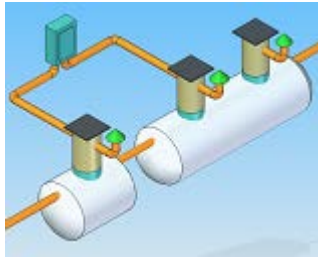
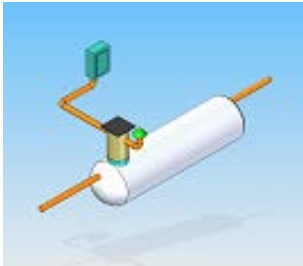
In high wind conditions, consideration should be given to strapping down the tanks to prevent damage

***Eyebolts are not supplied with the cylindrical one-piece tanks. All tanks less than 8m must be lifted using slings**

Tank orientation:

Tanks may be combined for larger capacities. Tanks will have internal dividers, creating chambers or baffles within the tanks.

Sample Orientations:



Sample Modules



1 Module



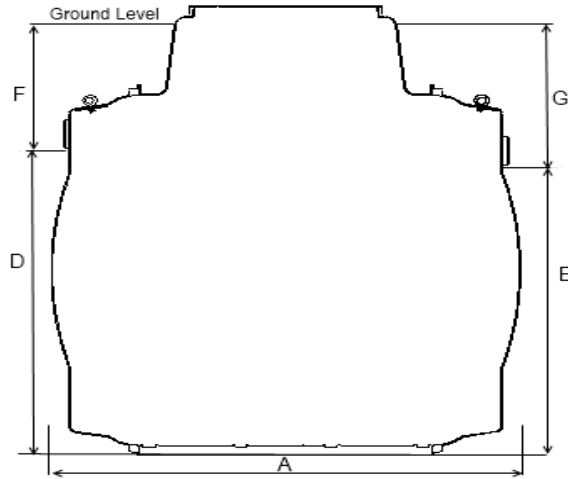
3 Modules



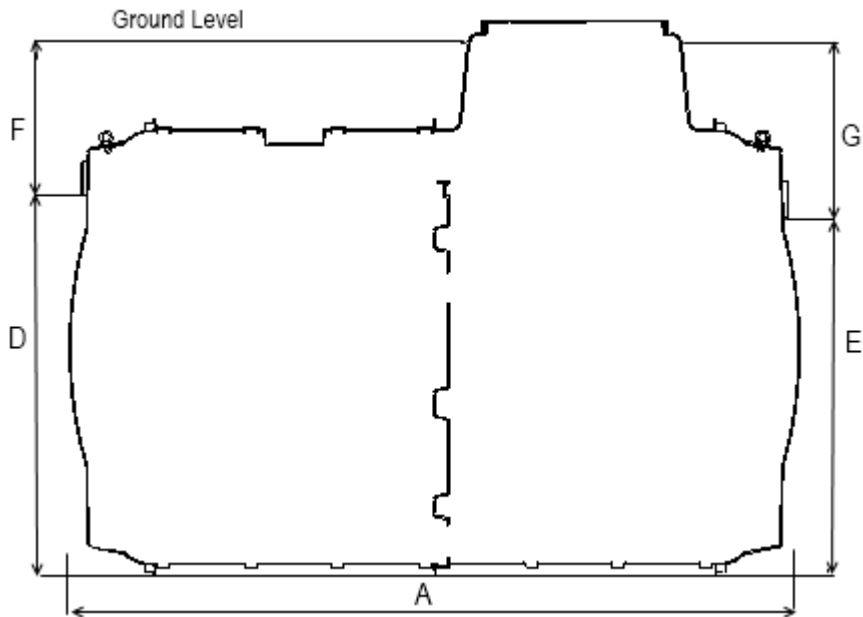
5 Modules

Tank drawings – SMC modular tanks:

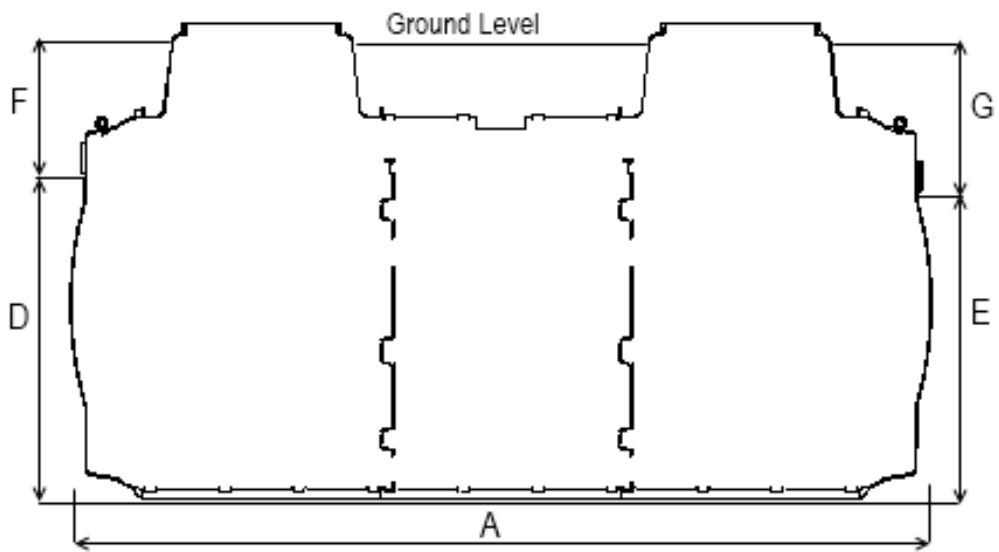
Tricel SMC Tank (1 modules long)



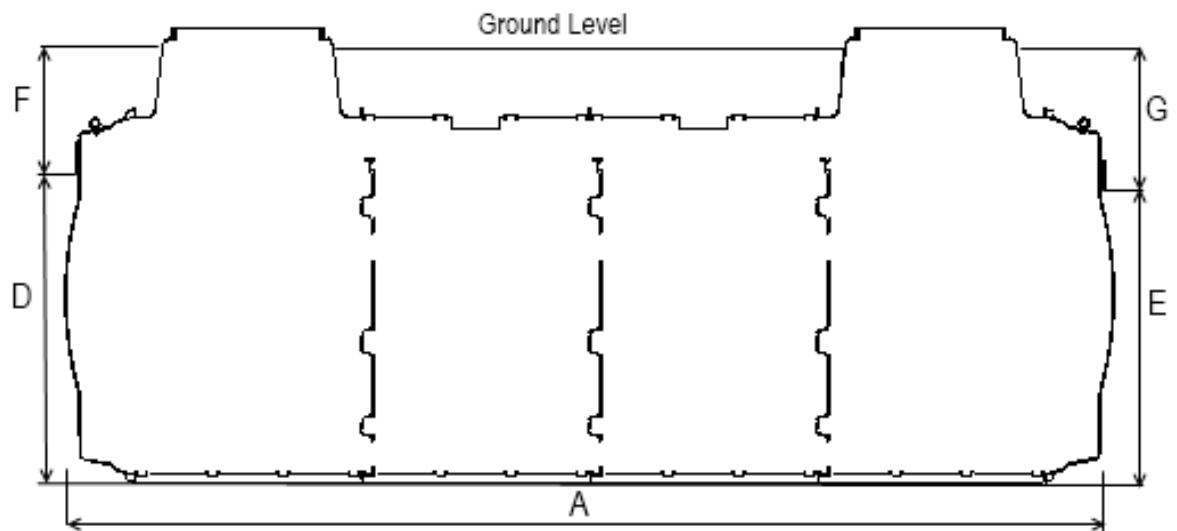
Tricel SMC Tank (2 modules long)



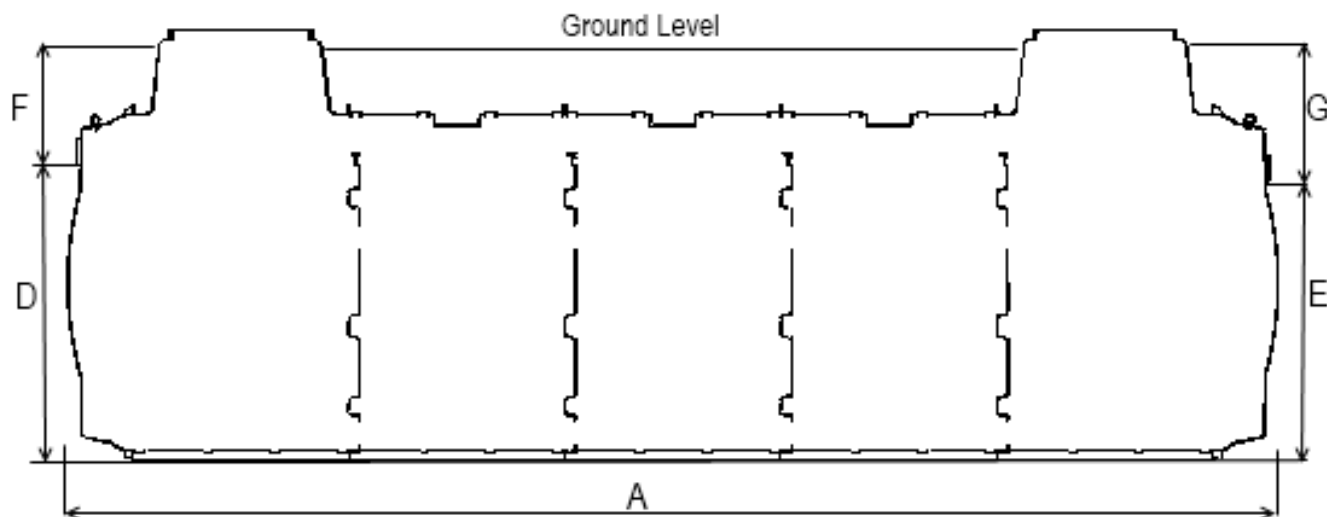
Tricel SMC Tank (3 modules long)



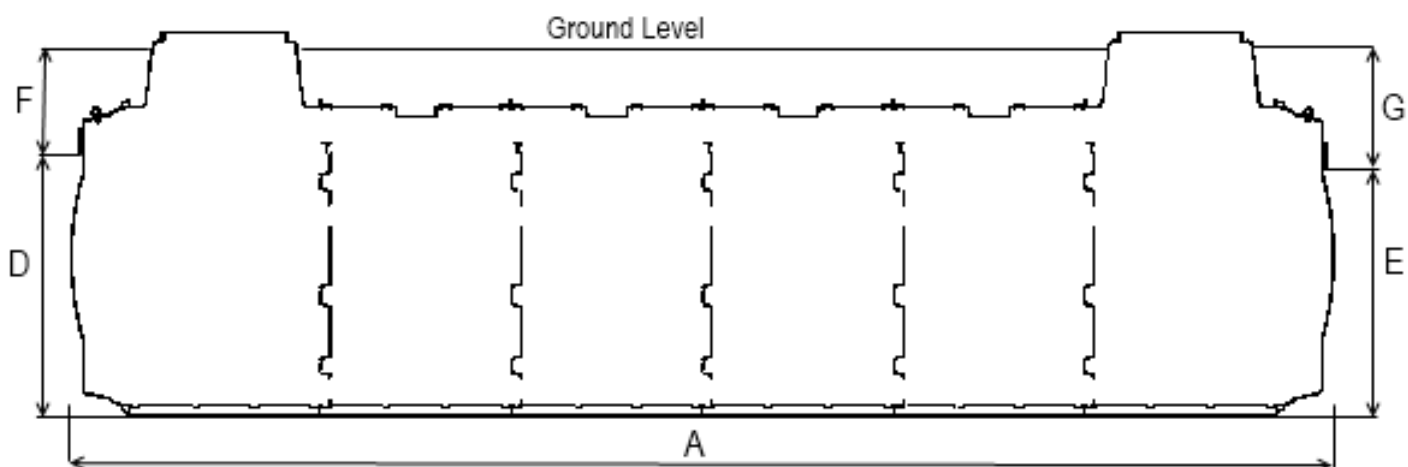
Tricel SMC Tank (4 modules long)



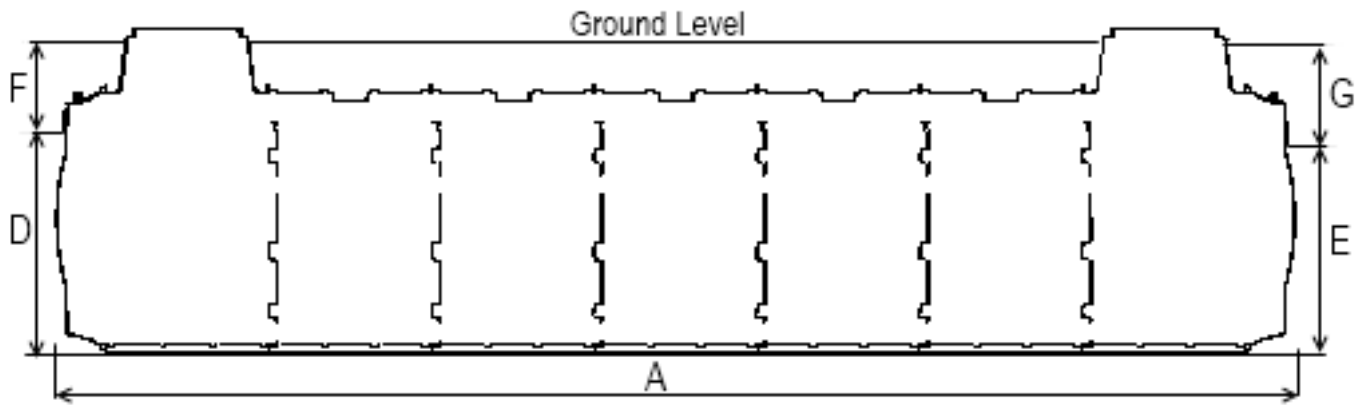
Tricel SMC Tank (5 modules long)



Tricel SMC Tank (6 modules long)



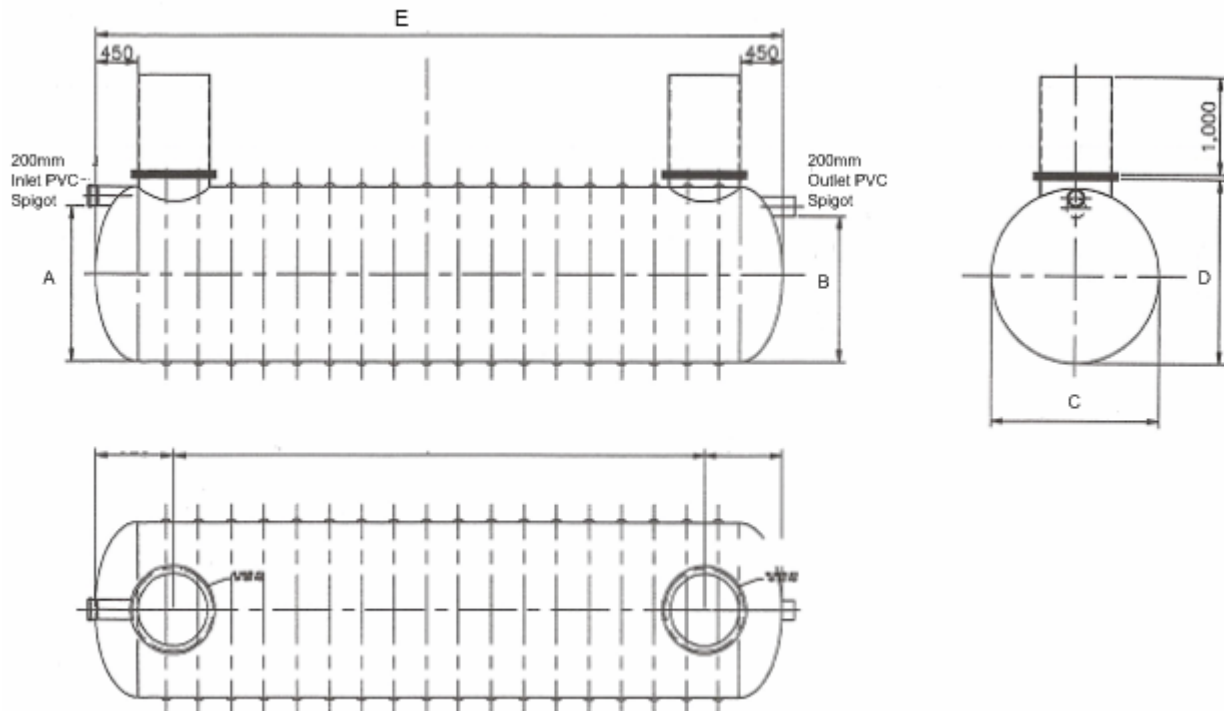
Tricel SMC Tank (7 modules long)



Tank dimensions – SMC modular tanks 1.65 diameter:

Modules		1	2	3	4	5	6	7
Nominal Capacity	litres	2607	4496	6385	8274	10163	12057	13941
Actual Capacity	litres	2286	3916	5546	7176	8806	10436	12066
Diameter	m	1.65	1.65	1.65	1.65	1.65	1.65	1.65
Length (A)	m	1.6	2.6	3.6	4.6	5.6	6.6	7.6
Overall Height	m	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Tank Weight	kg	140	222	303	405	485	565	645
Inlet/Outlet Pipe Diameter	mm	110	110	110	110	150	150	150
Inlet invert to base (D)	m	1.375	1.375	1.375	1.375	1.35	1.35	1.35
Outlet invert to base (E)	m	1.3	1.3	1.3	1.3	1.275	1.275	1.275
Inlet Invert to Ground Level (F)	m	0.545	0.545	0.545	0.545	0.57	0.57	0.57
Outlet Invert to Ground Level (G)	m	0.62	0.62	0.62	0.62	0.645	0.645	0.645
Height above ground level	m	0.32	0.32	0.32	0.32	0.32	0.32	0.32

Tank drawing – one piece cylindrical tank:



Tank dimensions – one piece cylindrical tanks 1.8-3m diameter:

**Standard tanks are as follows:
Sizes and capacities given are indicative only and may vary.**

Capacity (nominal)	Dia (OD approx) C	Length (approx) E	Inlet Level to Base (A)	Outlet Level to Base (B)	Tank Base to Shaft base (D)
12,000	1.8m	4.8	1.6	1.5	1.9
16,000	1.8m	6.4	1.6	1.5	1.9
18,000	1.8m	7.1	1.6	1.5	1.9
20,000	1.8m	8	1.6	1.5	1.9
24,000	1.8m	9.5	1.6	1.5	1.9
25,000	1.8m	10.2	1.6	1.5	1.9
28,000	1.8m	10.8	1.6	1.5	1.9
30,000	1.8m	11.6	1.6	1.5	1.9
34,000	1.8m	13.2	1.6	1.5	1.9
38,000	1.8m	14.6	1.6	1.5	1.9
40,000	1.8m	15.5	1.6	1.5	1.9
16,000	2.5m	4.8	2.3	2.2	2.6
20,000	2.5m	5.8	2.3	2.2	2.6
23,000	2.5m	6.7	2.3	2.2	2.6
26,000	2.5m	7.4	2.3	2.2	2.6
28,000	2.5m	8.2	2.3	2.2	2.6
30,000	2.5m	6.55	2.3	2.2	2.6
33,000	2.5m	9.2	2.3	2.2	2.6
46,000	2.5m	9.8	2.3	2.2	2.6
50,000	2.5m	10.6	2.3	2.2	2.6
60,000	2.5m	11.8	2.3	2.2	2.6
70,000	2.5m	14.7	2.3	2.2	2.6
75,000	2.5m	15.7	2.3	2.2	2.6
84,000	2.5m	17.6	2.3	2.2	2.6
70,000	3.0m	11	2.8	2.7	3.1
75,000	3.0m	11.1	2.8	2.7	3.1
90,000	3.0m	13.3	2.8	2.7	3.1
100,000	3.0m	14.7	2.8	2.7	3.1
110,000	3.0m	16.1	2.8	2.7	3.1
120,000	3.0m	17.5	2.8	2.7	3.1
130,000	3.0m	18.9	2.8	2.7	3.1
140,000	3.0m	20.3	2.8	2.7	3.1
150,000	3.0m	21.7	2.8	2.7	3.1

Manhole risers – (deep inverts):

Manhole Risers are available for deeper installation requirements. Only Tricel manhole risers should be used.

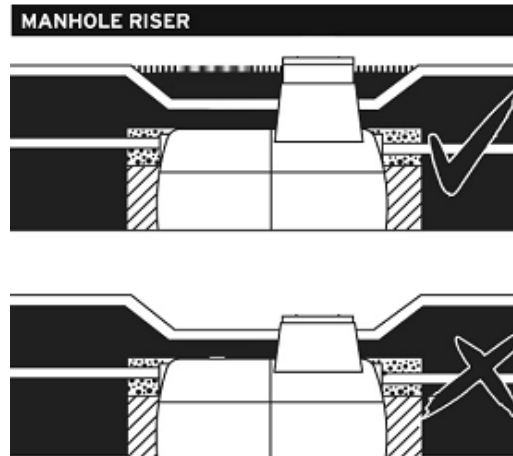
Modular Tanks:

- **250mm** manhole risers require a standard installation.
- **500mm** manhole risers require a **complete concrete** backfill – See notes on deeper tank installation and wet sites installation.
- **750mm** manhole risers require a **complete concrete** backfill – See notes on deeper tank installation and wet sites installation.

Never place the covers of the tank below ground level.

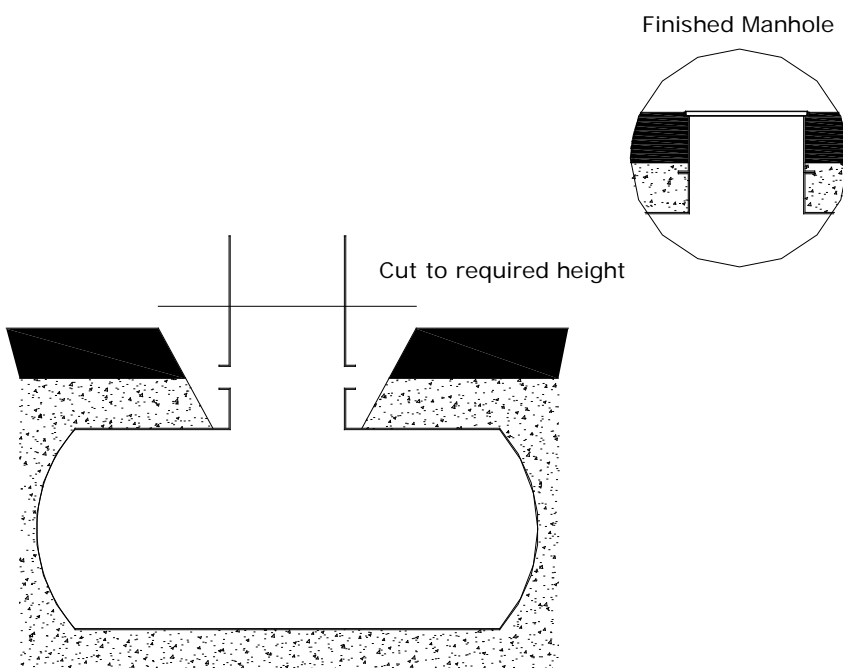
Do not allow ground water enter the system

Only Tricel Risers should be used.



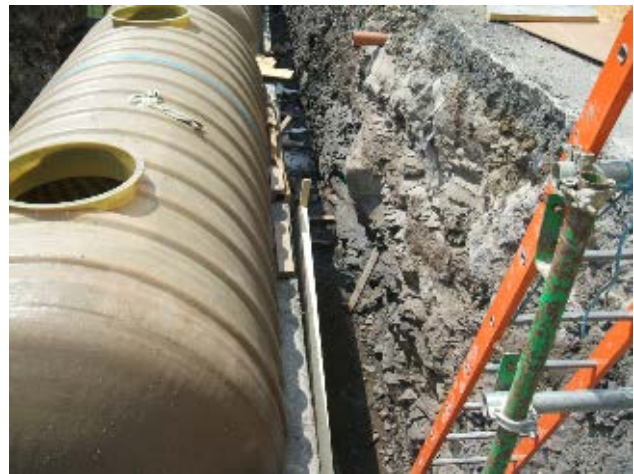
Manhole risers are available as standard
250mm
500mm
750mm

Cylindrical One Piece Tanks:



Manhole Risers are supplied **1000mm** as standard and are cut to the required height on site. Deeper inverts are available. However, these can only be offered prior to tank production, as a stronger shell is required to accommodate it.

Installation:



Important Note:

**Storm water, Rainwater & Grey water tanks, along with pumping chambers & separators, may require a concrete surround, as the tanks may be empty from time to time.
Other instances, due to onsite conditions may also require that a concrete surround be used
If unsure, please consult the consultant, onsite civil engineer or the manufacturer.**

Pre – installation inspection:

- Tanks should be subject to a visual inspection prior to installation
- Check for, fractures to the shell or ribs, de laminations, scratches or abrasions deeper than 1.5mm.
- Any damage should be notified to the delivery driver and/or to your supplier
- Do not attempt to carry out any unauthorized repairs, as this will invalidate the warranty on the tank
- Once the tank has been installed, we cannot accept claims for damage

Quick installation overview:

A **Dry site** is one where the water table never rises higher than the base of the tank.

A **Wet Site** is one where the water table may rise higher than the base of the tank.

The unit should never be installed where ground water can rise higher than the outlet pipe.

Guidelines	Dry Site	Wet Site
All installations must be "Fit for purpose" to suit the on-site conditions, which will vary from site to site. This is the responsibility of the onsite contractor.	✓	✓
Never roll the tanks. Tanks are to be lifted into position in accordance with suppliers instructions	✓	✓
The unit should be located as far away from the dwelling as is practically possible considering topography and pipe work levels. Separation distances must meet all National and Local regulations	✓	✓
Dig a hole circa 500mm – 1000mm larger than the system in plan. See table 1.1 for guidelines	✓	✓
Remove any soft spots or boulders of any significant size from the base or sides of the excavation	✓	✓
Ground water must be pumped to give a dry excavation and excavation lined with polythene		✓
A base is then formed using compacted gravel and this must be flat and level.	✓	
A base is constructed of a thin layer of compacted gravel covered with a 250mm – 500mm layer of concrete. See table 1.1 for guidelines		✓
Ensure material is clean and contains no large materials.	✓	✓
Lift tank into position and align as required for connecting pipe work, access shafts etc.	✓	✓
Ensure that the correct orientations are achieved of the system, which may contain 1 or more tanks.	✓	✓
Ensure that each tank is 100% level, and that inlet/outlets are in the correct orientations.	✓	✓
Secure anchor straps if required.	✓	✓
Connect any low-level pipe work, as required.	✓	✓
Ballast the tank with water.	✓	✓
Mount and seal any turret extensions.	✓	✓
Commence gravel backfilling in 300mm layers approximately up to 100mm over the cylindrical body of the tank, ensuring tank and any pipe work is properly supported.	✓	
Commence concrete backfilling in 300mm layers approximately up to the pipe work level, ensuring tank and any pipe work is properly supported.		✓
Continue backfilling with primary material up to 100mm over the cylindrical body of the tank		✓
Complete backfilling with topsoil up to the max ground level line. Ensure that surrounding finished ground level is never higher than the max ground level line.	✓	✓
Compaction should be by lightweight rollers or vibratory plate compactor until "traffic" depth has been achieved	✓	✓
Compact evenly around the riser extensions to reduce risk of distortion.	✓	✓
Ensure that No surface loadings are transferred from the cover direct to the tank. Cover frame construction should allow movement.	✓	✓
An access chamber should be installed before and after the tank for sampling and to assist in clearing possible blockages	✓	✓

Note: The option of a reinforced concrete slab or deadman anchor may also be used on wet sites. This should be designed by an on-site structural engineer to suit site conditions.

Detailed installation information:

Control of Groundwater

Tanks must not be subjected to buoyant forces during installation, taking account of ground water levels and surface water run-off, and their accumulation in the tank pit, even if tanks are anchored.

The excavation area should be adequately drained, to permanently remove ground water from the proximity of the tank (or tanks). This is critical in order to avoid flotation of the tanks. Incorrectly installed tanks that are subject to movement, rotation or flotation may become damaged, for which we cannot accept liability. Water should be removed as much as possible from around the tanks using piped drains.

Note: water logged sites

Tanks are not suitable to be used in waterlogged sites, where the ground water may rise above the outlet level. Please contact the supplier of the system if there are difficulties on site due to adverse water logging. Adequate drainage is important to improve wet sites, or sites with a high water table level. It is critical that water is removed from the area surrounding the system to prevent flotation, or ingress of water that could cause electrical failure within the system. Excessive loading caused by site water can harm the system, please consult with the manufacturer or a qualified engineer if in doubt.

Excavation Size:

Suitably sized equipment will be required to excavate the hole and to crane the system into place.

Installation depends on on-site conditions, water, slopes, location etc. Excavation should be planned with due regard to Health and Safety requirements, and should be either shored or battered back to a "safe" angle. The excavation should allow a minimum 250mm to 500mm, clearance between tank and the excavation wall or face of shoring (see table 1.1). A minimum of 250mm - 500mm is also required between adjacent tanks. Unstable ground with excessive sand, peat swamps etc may require larger excavations.

External dimensions:

Length in meters x Diameter in meters

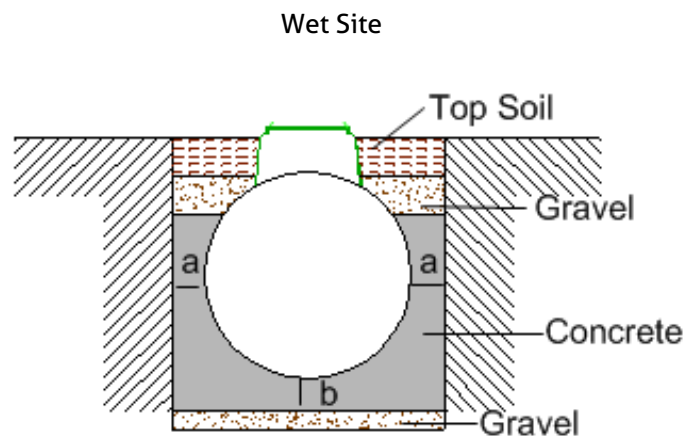
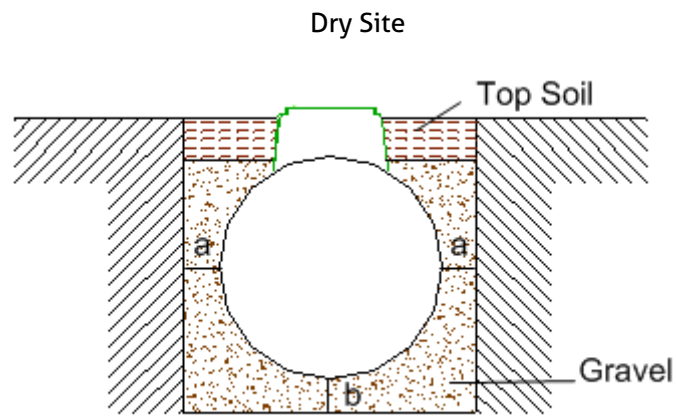
Total excavation: {Length + Clearance} x {Dia + Clearance} - See table 1.1

Excavation depth: Allow 250mm to 500mm for a tank base/plinth. - See table 1.1

Excavation Depth:

The excavation depth is determined by the inlet and outlet pipe, invert levels relative to the bottom of the tank, and allowing for the minimum base thickness shown. Dimension details of the tank are shown on the relevant drawing, supplied with the system. Ground instability at formation level e.g. running sand may necessitate over-excavation and stabilisation with hardcore or blinding concrete. The excavation should be maintained dry by pumping or whatever suitable means.

NOTE: Check that the depth to the base slab is within the Service Specification requirements for the tank.



Tank Dia in mm	"a" minimum in mm	"b" minimum in mm	Max Burial Depth
1650	250	250	1
1800	400	400	1.1*
2500	475	475	1.1*
3000	500	500	1.1*

Table 1.1

* Where 1000mm deep invert is used

Dry site installations:

Tank Base/Plinth:

- Remove any soft spots or large stones and boulders.
- The base is constructed using compacted gravel - see table 1.1
- Ensure that base is level and correct orientations are determined to accommodate the incoming pipe work.

Compacted Gravel Specification: See page 17 – Rounded Pea Gravel or Crushed Stone

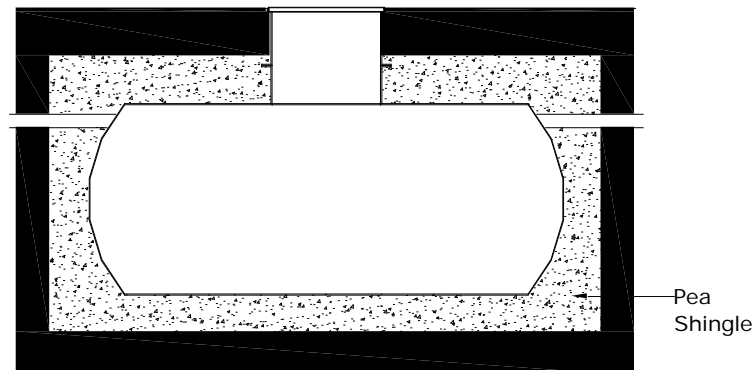
Installing onto the base/plinth:

- Lift the tank carefully into the hole and place on the prepared plinth
- The tank must sit dead level on the plinth
- The higher pipe on the tanks is to be connected to your upstream (inlet) pipe work and the lower pipe on the tank is to be connected to you downstream (outlet) pipe work. Connect and seal the pipe work to the tank, checking alignment to ensure there is an adequate fall for each pipe.
- Mount and seal manhole extensions (if used)

Backfilling Dry site:

Refer to backfill specification appropriate for site conditions

- Fill the tank with clean water to a depth of 300mm and recheck the pipe work levels. Commence backfilling evenly around the tank ensuring that there are no voids. Continue filling the chambers whilst backfilling, ensure that the progressive water level is no more than 300mm above the backfill level.
- Continue to backfill until material has reached 100mm above the top of the tank shell.
- Finish the remaining void with topsoil to ground level



Deeper tank installation & wet site installations:

A concrete surround is required, where a tank is buried greater than 800mm from ground level of the top of the tank and where sites conditions are considered wet.

A wet site is one where the water table may rise higher than the base of the Tricel unit.

The option of a reinforced concrete slab or deadman anchor may also be used. This should be designed by an on-site structural engineer to suit site conditions.

Concrete Surround and Plinth:

Tank Base/Plinth:

- Remove any soft spots or large stones and boulders.
- The base shall be constructed of a thin layer of compacted gravel covered with a layer of concrete – see table 1.1
- Ensure that base is level and correct orientations are determined to accommodate the incoming pipe work.
- It is important to maintain a completely dry excavation until the final pour of concrete is set. It may be necessary to line the excavation with a continuous layer of 1200 gauge polythene to maintain the integrity of the concrete.

Compacted Gravel Specification: See page 18 – Rounded Pea Gravel or Crushed Stone

Concrete Specification: See page 18 – Concrete Specification

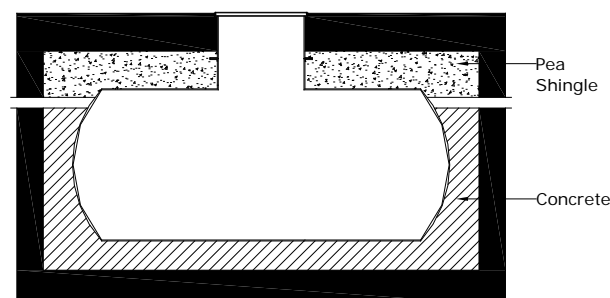
Installing onto the base/plinth:

- Lift the tank carefully into the hole and place on prepared plinth before the concrete sets
- The tank must be dead level on the plinth
- The higher pipe on the tanks is to be connected to your upstream (inlet) pipe work and the lower pipe on the tank is to be connected to you downstream (outlet) pipe work. Connect and seal the pipe work to the tank, checking alignment to ensure there is an adequate fall for each pipe.
- Mount and seal manhole extensions (if used)

Backfilling a wet site:

Refer to backfill specification appropriate for site conditions

- Fill the tank with clean water to a depth of 300mm and recheck the pipe work levels. Commence backfilling evenly around the tank ensuring that there are no voids. Continue filling the chambers whilst backfilling, ensure that the progressive water level is no more than 300mm above the backfill level.
- Backfill with concrete until it has reached the invert of the outlet pipe. Continue backfilling with stone until has reached 100mm above the top of the tank shell.
- Fill remaining void with topsoil to ground level.



Concrete backfill specification:

The specification for the concrete mix to surround the tank may be taken from BS 5328 : Part 1 : 1991 (including amendments), taking into account the site conditions and application requirements. For a typical non-structural application in non aggressive soils a Standard Mix ST4 with a 50mm slump is generally suitable, but also permits the equivalent Designated Mix GEN3 to be specified as an alternative. If for non typical applications, structural or other reasons a higher than normal designation is required, the purchaser of the fresh concrete can use table 6 in BS 5328: Part 2: 1991 (amendment 8759/October 1995) for guidance.

Lift height (rate of rise):

Determine the lift height (m), or rate of rise (m/h) for the specific concrete type used, to ensure that a design pressure (P_{max}) of 15kN/m^2 on the tank is not exceeded.

Vibration:

The design of the tank assumes minimal compaction of the surrounding concrete. Where necessary, this may be extended to include light internal vibration. Never use deep revibration which will substantially increase the pressure on the tank, possibly causing failure.

Impact of Concrete on Discharge:

Under no circumstances should concrete be discharged directly onto the tank.

Gravel backfill specification:

Primary Backfill Specification:

Primary Backfill material should be free-flowing granular material. Compaction should be by lightweight rollers or vibratory plate compactor until "traffic" depth has been achieved. Compact evenly around the turret extensions to reduce risk of distortion. Tanks must be installed with Primary Backfill only within the region immediately surrounding the tanks. This Primary Backfill must extend a minimum of 450mm outward from the tank, except directly beneath the tank where the backfill may be reduced to 300 mm.

The following materials are approved as primary Backfill:

Rounded Pea Gravel:

Minimum particle size 3mm, maximum 18 mm, compacted to a relative density of $>70\%$. 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 5% by weight passing 2.36 mm Sieve

Or

Crushed or Processed Stone:

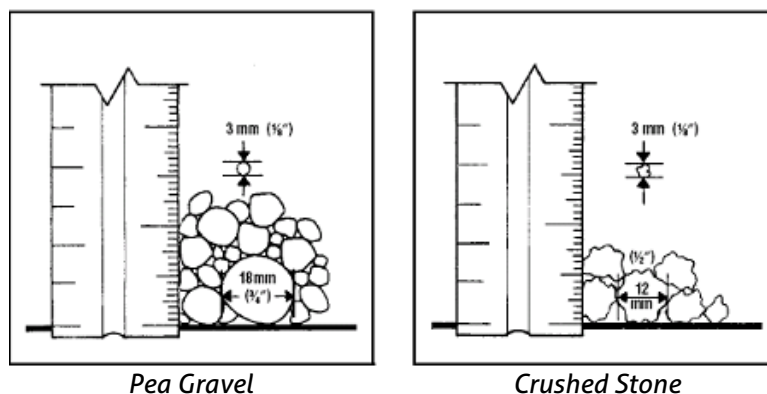
Minimum particle size 3 mm, maximum 12 mm, compacted to a relative density of $>40\%$

Dry Gravel density must be at least 1500 kg/m^3 . Material should be washed or screened to remove fine particles.

Upon screening analysis the backfill material shall have no more than 5% by weight passing 2.36 mm Sieve

Use of other than specified backfill and bedding materials will void the tank warranty.

Backfill material shall not be frozen or contain lumps of frozen material at any time during placement.



Top Soil:

Clean native topsoil shall not contain rocks larger than 36mm on largest dimension.

Note: The use of geo textile 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.

Burial depth:

Generally, the depth from finished ground level to the top crown of the main shell should be no more than 1 to 1.1 meters. See table 1.1. This may vary dependant upon ground water conditions.

Loadings:

If the tank is installed in an area where traffic or other superimposed loadings can be applied, consult a structural engineer for the design of a reinforced concrete slab to prevent the load being transmitted to the tank (or its concrete surround). If this slab is constructed immediately above the tank, it should be separated from the concrete surrounding the tank by a compressible material.



Electrical installation of the unit (if required):

- Electrical drawings will accompany each Tricel tank that requires an electrical connection.
- As electrical connections vary, it is important that the installer of the system comply with National rules & regulations.
- All electrical work to be carried out by competent person using suitable materials for the application. Electrical work must be carried out strictly to the manufacturer's instructions supplied with the system (optional)

Control Housings:

Monitoring equipment, alarms, blowers or pumps if supplied, may be placed into a control housing. These can be fitted with visual / audio / alarms along with other equipment. If so, a mains supply may be required. Only a qualified and competent person should attempt to do this wiring. This is not our responsibility. Only appointed personnel are allowed to hold a key this cabinet or kiosk. Mains must be disconnected before maintaining the system. The tank & control housing should be fenced off in a lockable compound along with the Tricel underground system.

Plumbing the system:

Competent ground-works site personnel should connect the plumbing to the system. The size of the inlet and outlet pipes varies for the modular tanks – See table on page 5.

One-piece inlet and outlet pipes are supplied as per specifications received. The working level within the tank should never be higher than the outlet pipe.

Finishing the garden to ground level:

The finished ground level should finish under the manhole cover, to prevent ingress of ground water into the tank.

Ventilation:

Ventilation is crucial to the system. The tank is supplied with a vent.

Fencing (optional):

Once the system has been completely installed, we recommend that a suitable fenced area should be constructed to ensure that access is restricted to the system and/or cabinet / kiosk. Access must be restricted to suitable trained personnel only. Access for maintenance or de-sludging must be available. Local authority / government regulations must be adhered to in relation to fence specifications and design.

Terms & Conditions:

Subject to our standard terms and conditions, available on request.

In accordance with our normal policy of product development, this specification is subject to change without notice.

April 2014



TRICEL

GENERATIONS OF INNOVATION

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