

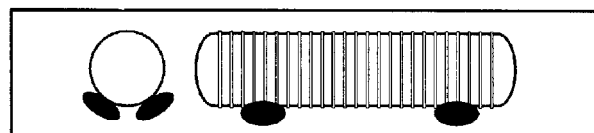
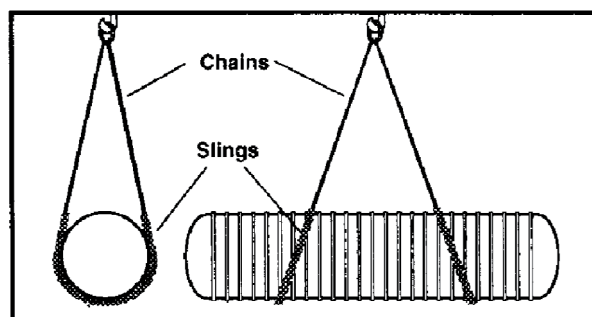
Underground Tank Installation Guide (Granular Surround)

Note:

- These guidance notes refer only to the installation of Granular surround underground tanks.
- These guidance notes cannot provide specific, site-related installation instructions.
- If in any doubt whatsoever about any aspect of the installation please contact Purewater Storage Ltd on 0121 323 4000.

Transportation, unloading and storage of tanks

- Tanks must be held down during transportation using nylon straps, do not use cables or chains to hold tanks.
- Do not over tighten straps to cause deformation of the tank shell.
- Tanks are best lifted by crane and webbing lifting straps – do not use chains or wire ropes in contact with the tank.
- Purewater Storage Ltd recommends the use of a lifting beam for tanks longer than 8 metres.
- 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.
- Move tanks only by lifting and setting, do not drag or roll.
- Do not drop or roll tanks from truck.
- Place tanks carefully onto a smooth level even surface, free from rocks, large stones or other debris that could cause point loads.
- Chock tanks using tyres, sandbags or similar to prevent rolling.
- In high wind conditions, consideration should be given to strapping down the tanks to prevent damage.



Pre-Installation Inspection

- Tanks should be subject to a visual inspection prior to installation.
- Special consideration should be given to strap positions.
- Any damage should be notified to the delivery driver and to Purewater Storage Ltd.
- Do not attempt to carry out any unauthorised repairs, as this will invalidate the warranty on the tank.
- Check for: fractures to the shell or ribs, de laminations, scratches or abrasions deeper than 1.5mm, stress cracks or star crazing.
- Check invert depth is correct, tank is correct grade for granular surround and inlet and outlet pipe orientations are correct.



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Excavation Size

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 450mm clearance between tank sides and ends and the excavation wall or face of shoring. 450mm minimum is also required between adjacent tanks.

Native soils with low bearing capacity (equivalent to less than 12 SPT blow counts) will require clearance to tank wall increased up to half the tank diameter.

Terram Filter Fabric may be required to prevent migration of backfill material.

Buoyancy & Anchoring

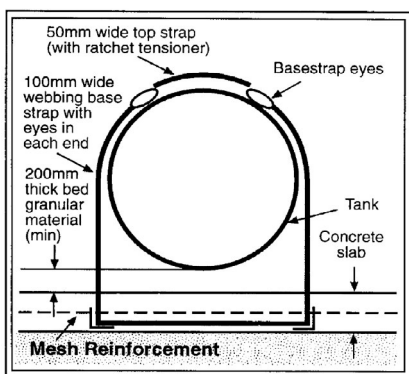
Where depth of cover over the tank exceeds 70% of the tank diameter, it will not require mechanical anchoring in worst case conditions of empty tank with tank pit flooded to ground level. If depth of cover is less than this, then mechanical anchoring is required for worst case conditions.

Two methods are possible :-

a) Reinforced Concrete Anchor Slab

Reinforced concrete anchor slab of minimum thickness of 200mm, sized to cover the excavation area.

The slab should incorporate Purewater Storage Ltd’s webbing anchor straps.

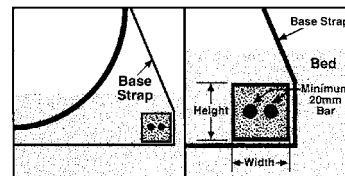


If maximum water table can be determined at lower than ground level, then the requirement for anchoring can be reviewed – contact Purewater Storage Ltd for details.

b) Concrete Deadman Anchors

Reinforced (two 20mm steel bars) concrete beam (pre-cast or in situ) each side of the tank of equal length to the tank, and with section as shown below. Use Purewater Storage Ltd’s webbing anchor straps as illustrated below:

Deadman should not lie in tank shadow.



Deadman size

Tank Diameter (mm)	Minimum Height (mm)	Width (mm)
1800	300	300
2500	300	300
3000	300	450
4000	200	900

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Primary Backfill Specification

Primary Backfill material should be free-flowing granular material and can be one of the following:-

- Rounded Pea Gravel, minimum particle size 3mm, maximum 18mm, compacted to a relative density of >70%
- Crushed or Processed Stone, minimum particle size 3mm, maximum 12mm, compacted to a relative density of >40%

No more than 5% may pass a 2.36mm sieve size.

Bedding Depth should be minimum 300mm below the tank (200mm if Reinforced Concrete Anchor Slab).

Dry Gravel density must be at least 1500 kg/m³.

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 sides and ends, excepting directly beneath the tank where the backfill may be reduced to 300mm.

The following materials are approved as Primary Backfill:

Pea Gravel

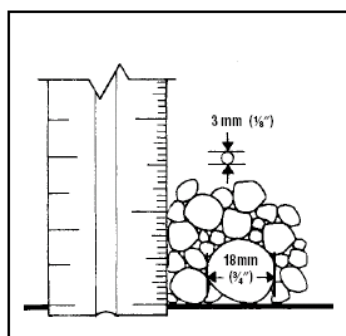
- Naturally rounded aggregate with particle size not less than 3mm and not greater than 18mm.
- Gravel shall be clean and free flowing, free from large rocks, dirt, sand, roots, organic materials or debris.
- Upon screening analysis the backfill material shall have no more than 5% by weight passing 2.38mm Sieve.

Crushed Stone

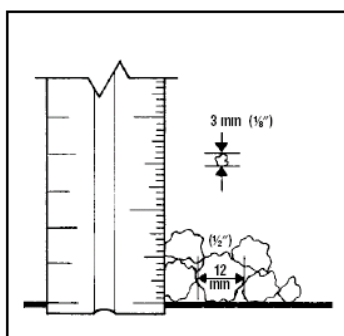
- Crushed stone or gravel with particle size not less than 3mm and not greater than 12mm.
- Aggregate shall be clean and free flowing, free from large rocks, dirt, sand, roots, organic materials or debris.
- Material should be washed or screened to remove fine particles.
- Upon screening analysis the backfill material shall have no more than 5% by weight passing 2.38mm Sieve.
- Use of other than specified backfill and bedding materials will void the tank warranty.

NOTE:

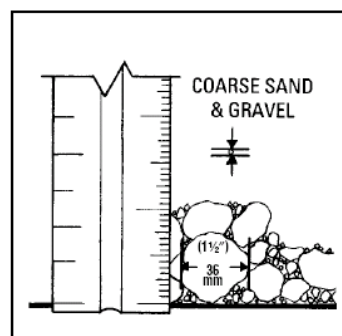
- All backfill material shall be free of ice and snow at time of installation.
- Backfill material shall not be frozen or contain lumps of frozen material at any time during placement.



Pea Gravel



Crushed Stone



Secondary Backfill

Secondary Backfill Specification

- Secondary backfill shall not be used adjacent to the tank.
- Secondary Backfill may be used only at a distance of 450mm from the tank walls.

The following are approved as Secondary Backfill materials:

Coarse Sand or Gravel

Coarse sand or gravel containing rocks no larger than 36mm 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 0.075mm Sieve. During placement this backfill material must be compacted to 95% Relative Compaction.

Select Native Backfill

Clean native backfill, or clean selected backfill, containing rocks no larger than 36mm on largest dimension. This material must be compacted to 95% Relative Compaction. The quality of this backfill material shall be such that it exhibits an ultimate bearing strength in excess of 170 kPa in the compacted state.

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 & cover

Tank Diameter (mm)	Minimum Cover (mm)	
	With Live load	Without Live load
1800	900	500
2500	900	500
3000	1000	500
4000	1200	500

The minimum cover with live load can be reduced by using a reinforced concrete slab above the tank. Contact Purewater Storage Ltd for information.

These tanks are designed to be installed below ground and completely surrounded with Granular Material. Generally, the depth from finished ground level to the top crown of the main shell should be no more than 2 metres. This may vary dependant upon ground water conditions. Deeper inverts may be accommodated on a standard shell providing the water table level does not exceed 2 metres above the top crown of the main shell. For deeper burial with high water table conditions heavy duty shells are available. Should you be in any doubt regarding suitable shell application please call our sales number 0121 323 4000.

If the tank is installed outside these parameters it may suffer irreparable damage.

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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 should be maintained dry by pumping or whatever suitable means until the cover depth reaches 300mm minimum above the tank

Alternatively, fill the tank with water as ballast after backfill until it has reached the top of the tank.

If this is not achievable tanks may be filled with water as ballast until required conditions are achieved. If water filling is carried out during backfilling, water level inside tanks must not exceed the level of backfill material outside the tank.

Installation

- 1 Excavation and anchorage provision in accordance with preceding information
Ground water must be pumped to give a dry excavation.
- 2 Place bedding material as described in preceding information.
Ensure material is clean and contains no oversize material.
- 3 Lift tank into position and align as required for connecting pipe work, access shafts, etc.
- 4 Secure anchor straps, if used.
- 5 Connect any low-level pipe work, as required.
- 6 Commence backfilling in layers approximately 300mm, ensuring tank and any pipework is properly "haunched".
- 7 Continue backfilling with select material evenly around the tank to at least 300mm above the tank top, connecting any high-level pipe work, as required. Mount and seal any turret extensions.
- 8 Backfill evenly to grade using the same primary backfill material, OR select secondary backfill material or road base material.
- 9 Compaction should be by lightweight rollers or vibratory plate compactor until "traffic" depth has been achieved.
- 10 Compact evenly around the turret extensions to reduce risk of distortion.
- 11 Cut turret extensions to length and fit manhole cover and frame.
- 12 Important - Ensure that No surface loadings are transferred from the cover direct to the tank. Cover frame construction should allow movement.
- 13 Inspect tank internally to ensure roundness is maintained and deflection does not exceed 1% of the tank diameter.

Access Shaft Extensions

Loose shafts should be sealed using silicon sealant sikaflex -291 or similar prior to installation to prevent ingress of groundwater under high water table conditions. It is the contractors responsibility to ensure a watertight seal.