



FERTILIZERS

*Quality Ingredients
Australian Made
Family Owned*

Bulk Tank Delivery, Storage & Handling Guidelines



SLTEC® Fertilizers provide a wide range of fluid fertilizer products and many of these are now delivered in bulk and stored on farm in fertilizer tanks.

This guideline provides a summary of SLTEC®'s storage and handling standards and policies for on farm bulk fluid fertilizer storage.

www.sltec.com.au

Fluid Fertilizers

Since the late 1990's there has been a substantial shift in the forms of fertilizer used. Traditionally almost 100% of the fertilizer used in Australia has been granular dry fertilizer, however the use of fluid fertilizer, particularly in the broadacre and horticultural markets has grown significantly.

One example of the shift involves the recent changes in Nitrogen topdressing options. The use of Urea Ammonium Nitrate or UAN has provided the most substantial and progressive shift in fertilizer practices where the broad acre and pasture markets have adopted UAN in preference to Urea as a top dress option. Following this shift the use of trace elements and stimulants in blends with UAN have also grown.

It is often reported that fluid fertilizers cost more. So why has the agricultural market place embraced this new form of fertilizer so enthusiastically?

Fluid fertilizers provide many benefits including;

- Improved efficiency and precision in applying nutrients for crop requirements
- Improved recovery of applied nutrients through improved availability and mobility.
- Reduced labour and manual handling
- Reduced environmental losses such as volatilisation, fixation (becoming unavailable), runoff and leaching.
- Multi tasking synergies where multiple nutrients and pesticides can be applied together in one pass or application, thereby reducing labour, running costs, machinery wear and tear and depreciation.

SLTEC® Fertilizers provides a range of delivery options for our products ranging from 20 L, 220 L 1,000 L and Bulk Fluid Fertilizer.

This guideline summarises some practical tips and recommended practices in handling bulk fertilizers at retail depots and for on farm deliveries.

These guidelines are mandatory for situations where SLTEC® Fertilizer Tanks are provided on a rental basis to farms.

Going Bulk

Bulk fluid fertilizer storage facilities provide substantial benefits including;

- Virtually eliminating double handling and manual handling of fertilizer.
- Enables fertilizer to be injected into irrigation mainlines and submains without manual handling.
- Enables efficient loading of broadacre fertilizer rigs and spray units.
- Removes the issues associated with handling IBCs, 220 L and 20 L drums such as manual handling, triple rinsing, drum disposal/recycling.
- Reduces the risk of theft as bulk fertilizer tanks can be locked and secured and are difficult to remove from their storage location.
- Provides a substantial cost saving per litre of fertilizer purchased when compared to smaller pack sizes.



SLTEC® Bulk Delivery Policy

SLTEC® requires the following from you several days prior to your delivery;

- ☐ The contact details of the person or persons who will meet the truck driver, including both mobile and landline numbers.
- ☐ The road address details for delivery, including if possible a map (Google Map) showing the location of the tanks, road access instructions etc.

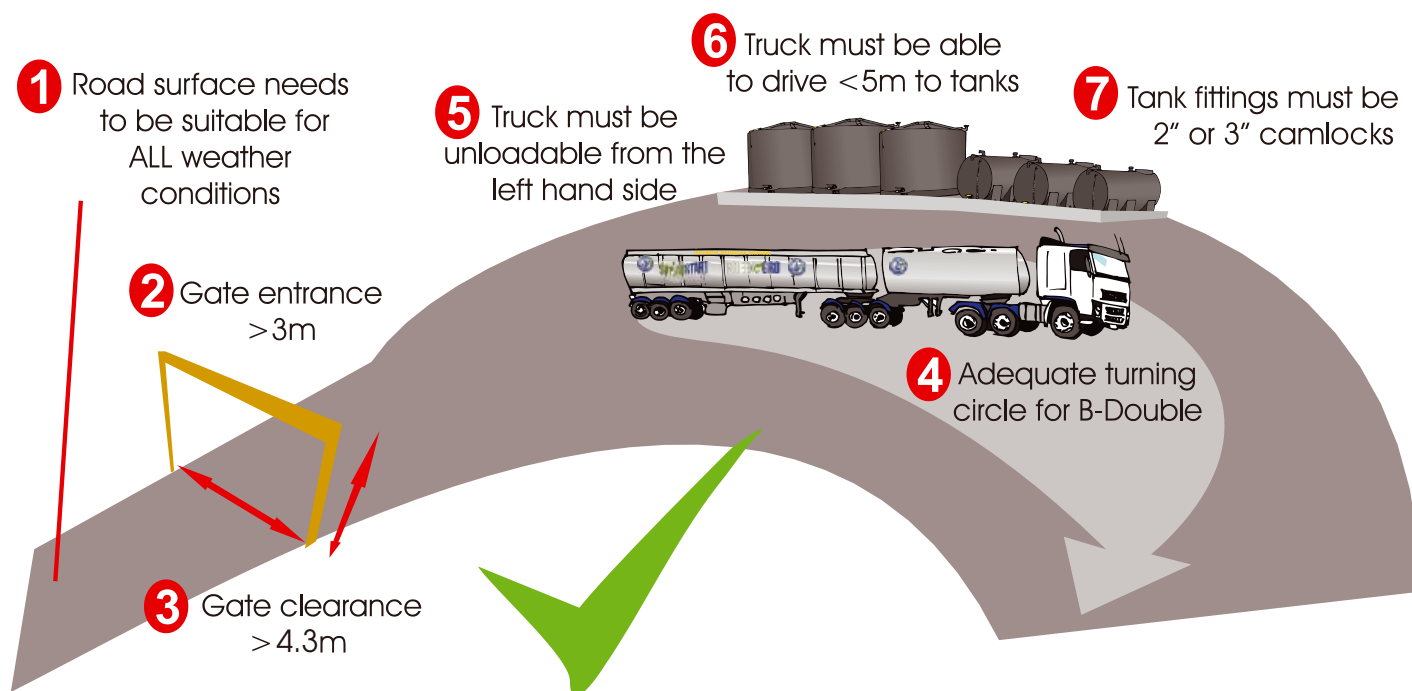
SLTEC® requires the following from you on the day of your delivery;

- ☐ Safe entry to the farm from a public road
- ☐ Farm roads in good condition capable of supporting tanker weight and size
 - A Single truck will have a carrying capacity of 26 Tonne with a total gross weight of 45-50 Tonne
 - A B Double truck will have a carrying capacity of 40 Tonne with a gross weight of 65-70 Tonne
- ☐ Farm bridges, creek and irrigation channel crossings being fit for tanker crossings under full load
- ☐ The provision of a clear area, free of rubbish and trip hazards between the delivery tanker and the tank filling point
- ☐ The location of tank fill points should be easy to reach (via WorkSafe approved platforms)
- ☐ Bottom fill tanks (ladders provide unacceptable risk)
- ☐ 2" or 3" Male Camlock fittings on tanks
- ☐ Tanks must be clearly labelled to ensure product is loaded into correct storage vessel

Please note: Any freight company charges for demurrage (taking longer than 1 hour to unload), truck diversions or product loss as a result of inaccurate information, unattended deliveries or faulty equipment will be your responsibility and charged accordingly.



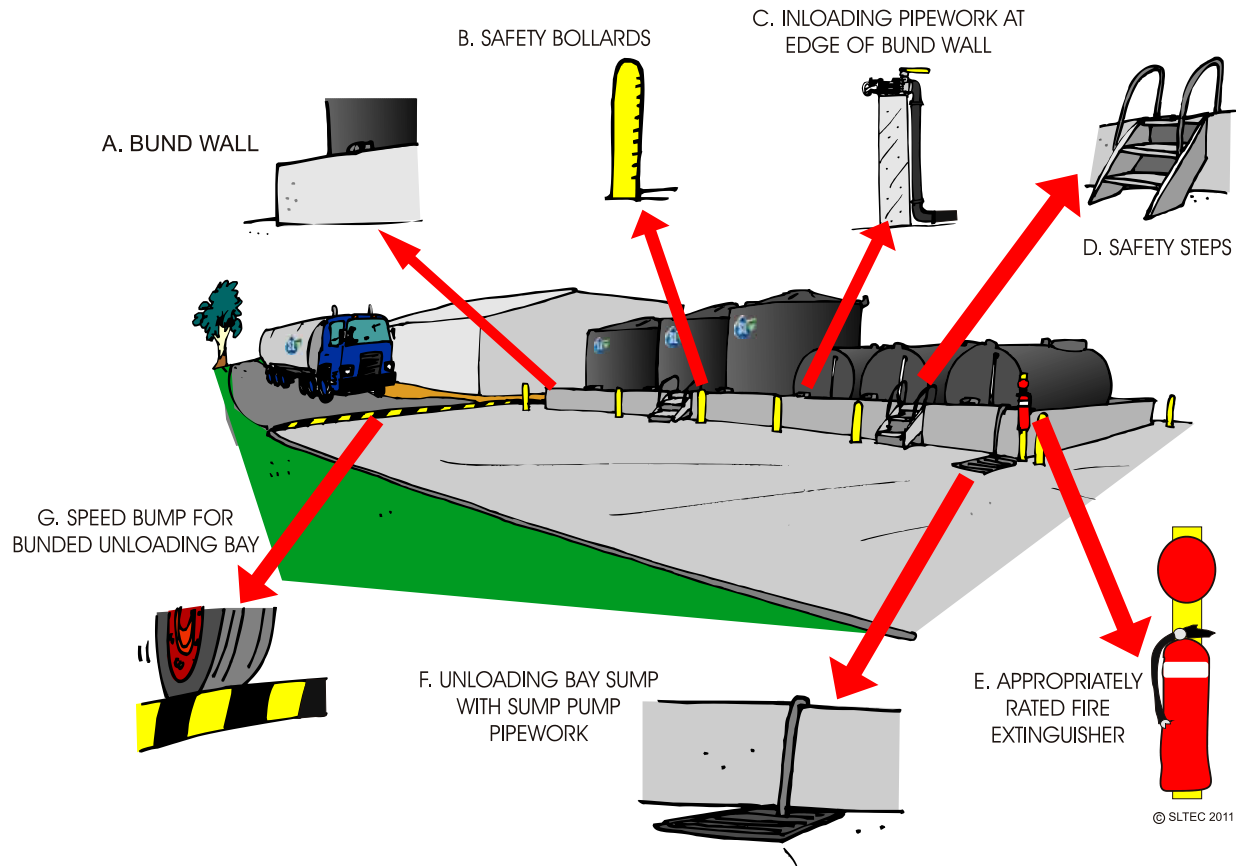
Download SLTEC®'s Bulk Fertilizer Client Delivery Checklist online at www.sltec.com.au/bulkchecklist/



Best Practice Guidelines

SLTEC® is totally committed to providing help and assistance with the storage and handling of bulk fluid fertilizer on your farm or business enterprise. If handled correctly, bulk fluid fertilizer saves time and money and greatly improves handling efficiencies.

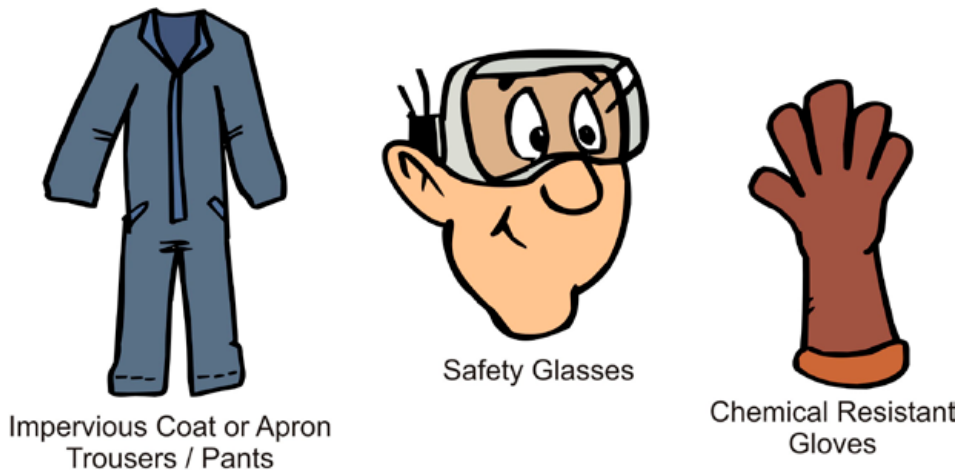
The following diagram provides a summary of best practice features of a well designed bulk fluid fertilizer storage system.



The location of unload and load points should be easy to reach (via ladders and platforms) and preferably at ground level in a bunded unloading area.

Safety Protective Equipment when Handling Fluid Fertilizers

The following safety equipment is recommended when transferring or decanting fluid fertilizer from any fluid fertilizer container or storage system.



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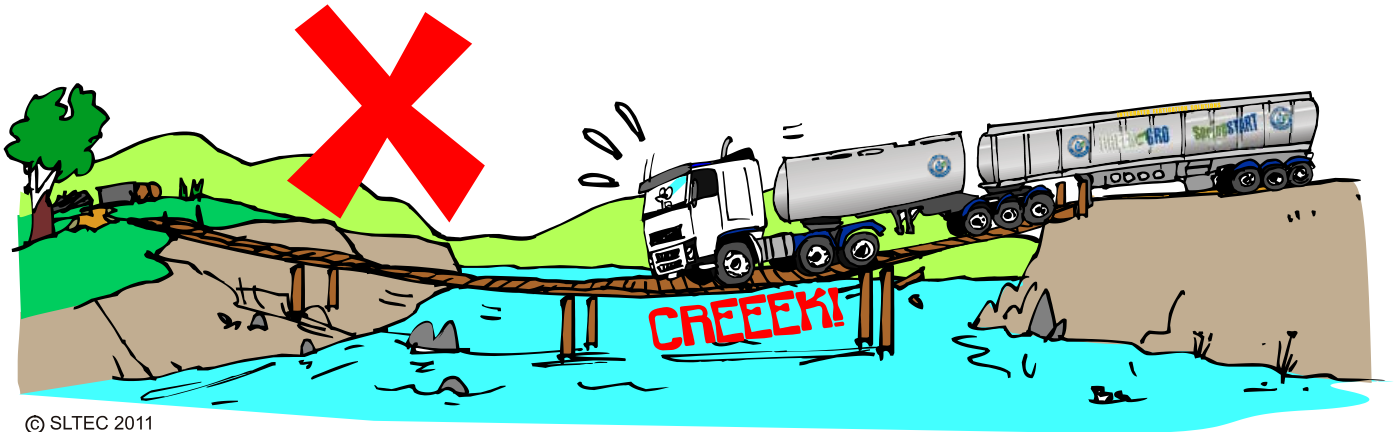
Where Should They Be Positioned? - Location, Location...

General Principles to Consider

Bulk fertilizer tanks should be positioned to allow safe access for delivery tankers, farm vehicles and machinery.

Safe access includes the following considerations:

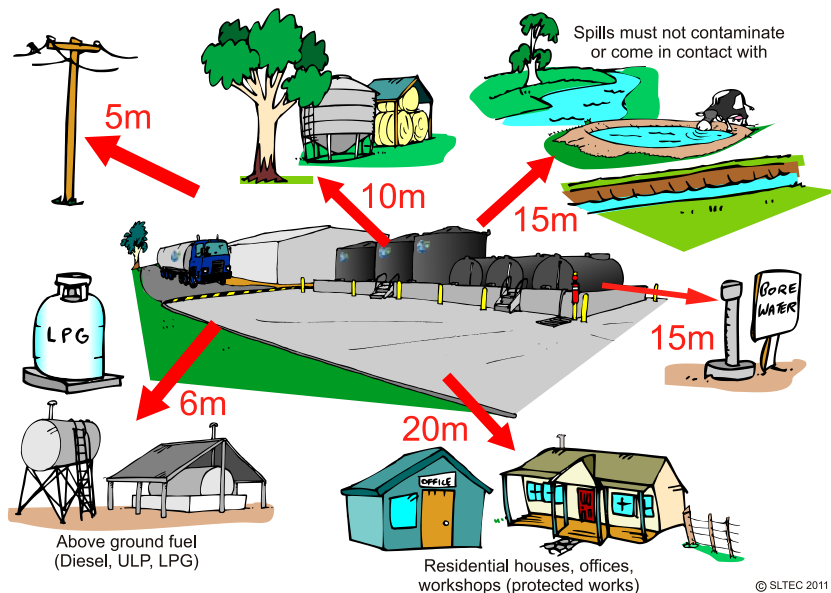
- Safe entry to the farm from a public road
- Farm roads in good condition capable of supporting a tanker weight and size
- Farm bridges, creek and irrigation channel crossings being fit for tanker crossings under full load
- The provision of a clear area, free of rubbish and tripping hazards, between the delivery tanker and the tank filling point



Guidelines for Separation Distances

All bulk fluid fertilizer storage must be:

- At least 6 metres from any hazardous materials, e.g. oxidizers, solid fertilizers, poisons and pesticides (agricultural chemicals)
- At least 6 metres away from any combustible materials such as diesel, LPG
- At least 20 metres away from any dwelling or other protected works
- Positioned so that any spills cannot contaminate stock feed or stock watering sources
- Positioned so that spilt fluid fertilizer cannot come into contact with any areas where welders, grinders and other maintenance equipment are being used
- Positioned so as to avoid accidental collision by vehicles
- Positioned so that any spills will not contaminate streams, lakes or waterways



Bunding & Spill Containment

What is a Bund and Why?

Bunds are simply low walls that are built around a structure to retain fluids. They must be used in conjunction with impervious flooring to ensure that the fluids do not seep out underneath the bund or into the ground.

A well built bund prevents spills and leaks of fluid fertilizer from entering waterways, polluting nearby land and contaminating the environment.

Concrete is the preferred building material because it is highly impervious to fluid fertilizers. Constructing a drainage sump in one corner of the bund and gently sloping the bund floor towards the sump enables any spills to be easily pumped out and recovered.

How Big Should the Bund Be?

The gross capacity of a bund area should be sufficient to hold at least 133% of the capacity of the largest tank containing fluid fertilizer, (OR at least 100% of the capacity of the largest tank plus 10% of the capacity of the second largest tank, whichever is the largest), plus any other major displaced volumes below the bund crest, including other tanks and raised foundations.

If two or more tanks are operated as a single unit, then the combined capacity of all such tanks should be used when calculating the capacity of the bund compound.

Bund Heights and Separation Distances

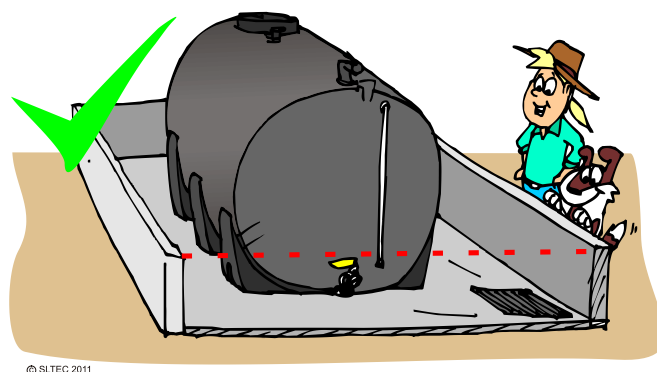
The distance from the tank to the bund wall, where possible should be half ($\frac{1}{2}$) the height of the tank (including any stands or pedestals). This principle is sometimes called the **Half Height Rule**.

Hence tanks and drums should be separated from the inner edge of the bund crest by a distance of half the height of the tanks or stack of drums on flat ground.

Wall-type bunds at tank storage facilities should be from 0.5 m to 1.5 m high, depending on the required containment capacity and the distance to the tank—the closer the wall to the tank, the higher the wall has to be.

If the bund walls are more than 1 m above the bund floor, provide steps or ladders for quick escape. For bund walls close to the tank or higher than 1.5 m, apply the rules for confined spaces for entry into the bund etc.

Where possible the wall should be high enough to prevent material from squirting over the top.



To cope with tank over-filling or overtopping incidents, the bunded volume should be capable of taking 100% of the largest compartment of any tanker used to fill the fertilizer storage tank, plus the volume of the tank(s) to be filled.

Most fluid fertilizer tankers are now compartmentalised to reduce the risks of fertilizer spillage following road accidents.

If fluid fertilizer supplies are always filled by properly trained, equipped and accredited delivery personnel, then an allowance for overfilling should not be necessary, but it is prudent practice always to include it even in this case.

The top inside edge of bund walls need to be positioned at least half the height of the tank from the tank but never closer than 1 metre.

Where fluid fertilizer is not rated as a dangerous good (ie. having a fluid pH < 2 or > 10 or having Class 5.1 Properties), the $\frac{1}{2}$ height rule serves as a guide to bund design only.

Where tall tanks are used it may not be practical to design fluid fertilizer bunds complying with this convention, hence it is a recommended practice where practical.

The Half Height Rule is an important design consideration when determining the floor dimensions of the bund where products classed as Dangerous Goods are concerned. For example, a tank of 2 metres in height on a pedestal of 250 mm thickness must be separated from the nearest bund wall by a distance of at least 1.125 metres $(2\text{m} + 0.25\text{m})/2$.

Rain Allowance Considerations for Bund Heights

For tank sites that do not have roofs and walls to prevent ingress of rainwater, the minimum bund height is 150 mm.

Bund Construction Guidelines

Building Materials:

- Floor slabs and bund walls, must be impervious to, and compatible with, the fluids to be contained.
- Concrete is the recommended construction material as it is robust and generally impervious.
- It is recommended that the floor and walls of a concrete bund be laid or formed on the same day (same time) to enable a strong seal between the walls and the floor, otherwise cracks may appear causing the bund to leak.
- Brick bunds are acceptable but often fail because of holes and cracks in mortar courses and the failure of the bond between the brickwork and the floor. Special care needs to be taken during the construction of brick bunds to eliminate all gaps and cracks in mortar courses and to ensure the integrity of all mortar bonds.
- Walls of concrete blocks can be filled with cement but the floor joins have to be sealed carefully.

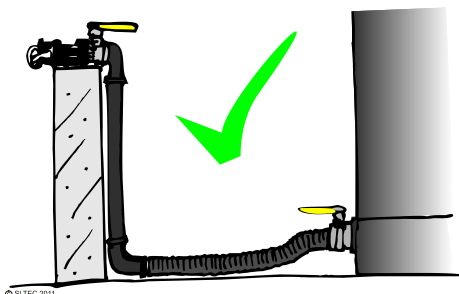


Vehicles

- Where access is required into a banded area, ramps or roll-over bunds should be used to maintain effective bund height.

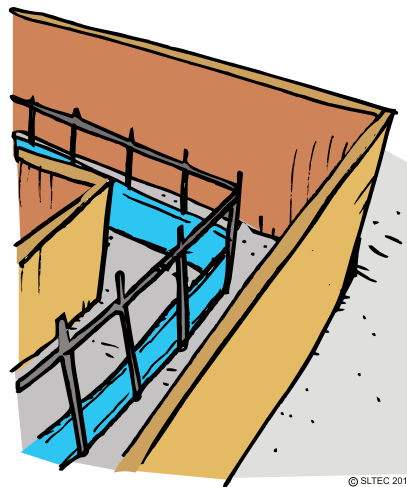
Piping and Pumping Facilities

- Piping and pumping facilities must be arranged so that no leaks can escape the confines of the bund, and so that the pumps will still operate when the bund is full of fluid.
- All pipe work should go over the bund walls, not through them. Pipe work through bund walls creates a point of weakness and potential for leaks.
- All valves, filters, sight gauges, vent pipes and other ancillary equipment should be situated within the bund and arranged so that discharges are contained.
- All pipe work should be sited above ground and properly supported to make inspection and repair easier. Fertilizer fill pipes and draw-off pipes should be positioned away from vehicle traffic to avoid collision damage.



Joints;


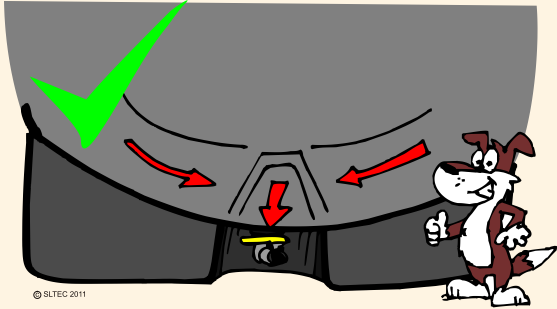
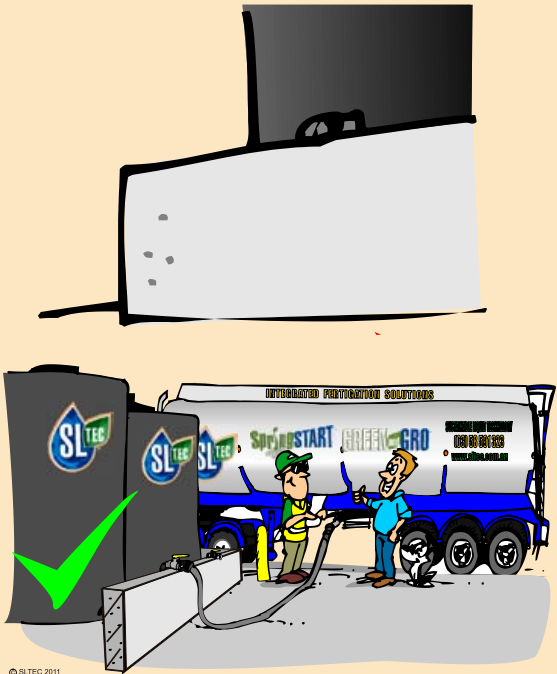
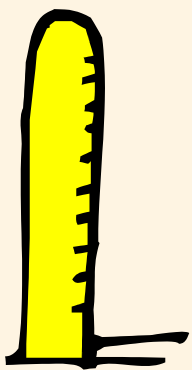
- Concrete bunds should be poured integrally with the slab.
- When joints are used in concrete or masonry systems, they should be sealed with a suitable sealant material that is impervious to, and compatible with, the fluids to be contained.
- The Supercast range of PVC waterstops are designed to provide an integral sealing system for movement and construction joints in concrete cast in-situ. Products like supercast should be considered to achieve a flexible and waterproof seal between bund floors and walls. For more details on Supercast products for bund walls: www.paritech.com.au



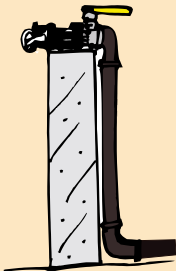
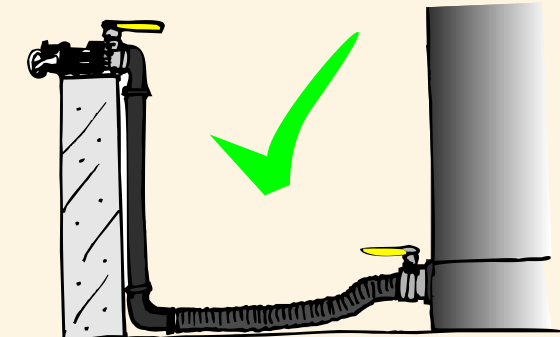
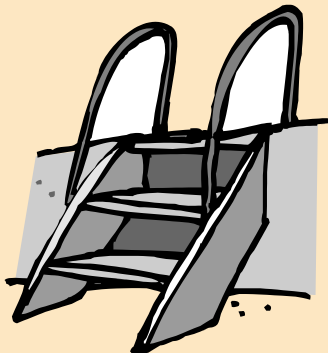

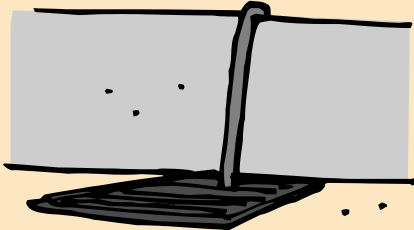
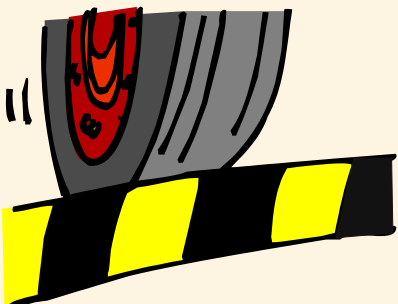
Drainage

- A collection sump must be provided in the bund floor to make it easy to remove fluids, and the floor must be graded in such a way that fluids collect in the sump.
- The sump must not be connected to storm water or sewer drainage systems — It is only a collection point from which to pump out the fluid; there must be no access to the storm water system within the bund.
- Bund drain valves must not be installed, and the pump controls must be outside the banded area.
- Although rainwater will often evaporate from within an open bund, if there is no rainwater in the bund after heavy rainfall the bund may not be properly sealed and should be inspected and repaired as appropriate.
- Removal of accumulated rainwater should be done with a manually operated pump, air driven pump, 240 v sump pump or by baling from the sump.
- Care needs to be taken to ensure any accumulated rainwater is not contaminated with fertilizer. A simple check of the pH and Electrical Conductivity (EC) can help and also if the bund area is kept clean and tidy with any leaking fittings or spills cleaned up immediately, then rain water collected in a bund will generally be clean and not pose a significant environmental risk if discharged onsite into storm water systems. Note you need to be sure that the water is clean and fertilizer free before discharging into areas that could impact on surface water quality.

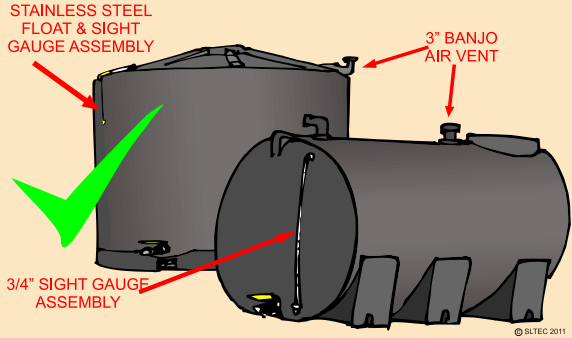
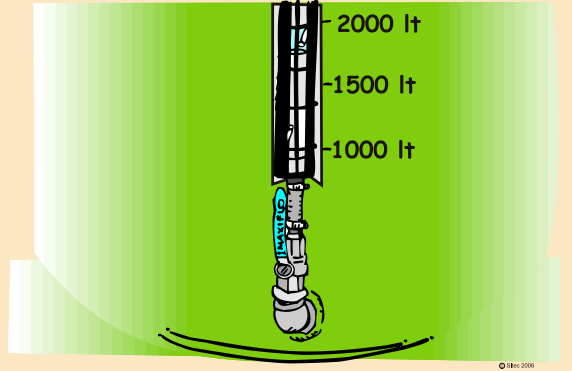
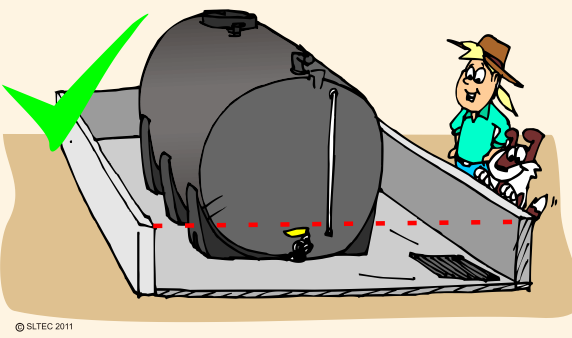
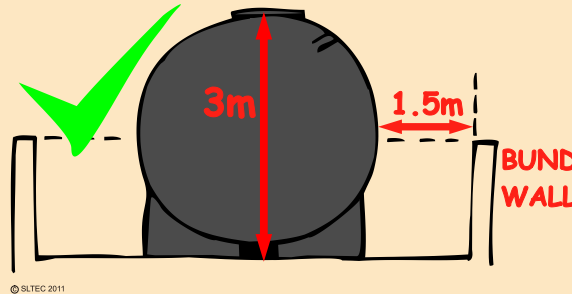
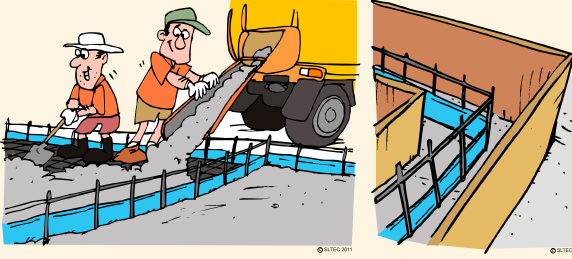
Best Practice Fluid Fertilizer Storage

Principle Risk Area	Best Practice Example	Description
Store Incompatible Fluid Fertilizers in Separate Dedicated Tanks		Some fluid fertilizers were never meant to mix. Hence dedicated tanks for calcium based products should be maintained.
Bulk Fertilizer Tank with Bottom Sump System		Some fertilizer tanks such as the SLTEC® tanks have an in built sump system that enables all the fertilizer to be easily drained from the tank. At the base of the sump is a valve enabling complete drainage of the tank.
Bund Wall: Containment of Leaks and Spills		<p>Installing a bund wall around bulk tanks means that in the event of a leak or major loss of containment event such as a tank failure, the contents of the tank can be retained and recovered.</p> <p>This minimises impacts to the wider environment and enables recycling or reuse of the valuable fluid fertilizer.</p>
Safety Bollards: Preventing Vehicles impacting on Tanks, Pipework and Bund Walls		<p>Safety bollards provide a physical and physiological barrier to protect imported structures such as cement bund walls, pipe work and tanks.</p> <p>They stop trucks, forklifts, tractors and other farm equipment from impacting protected areas.</p> <p>Bollards can be made out of a number of materials, however one example used by SLTEC® involves installing a 200 mm x 2 m steel hollow pipe into the ground, cementing 50 cm or 0.5 m into the ground with the remaining 1.5 m above ground. Once cement around the footings are set, the hollow centre of the steel pipe is filled with cement. Upon the cement drying the bollards are then painted in a safety yellow</p>

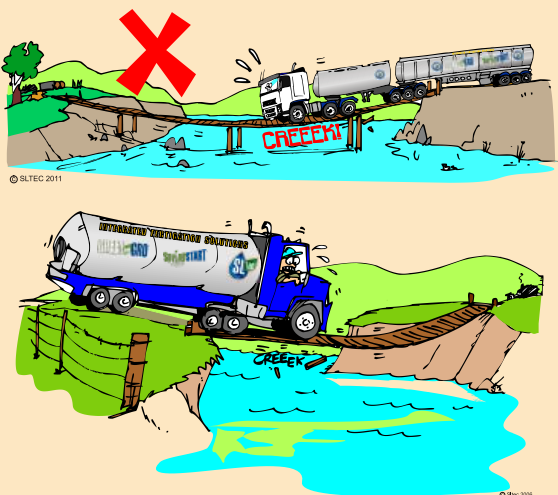
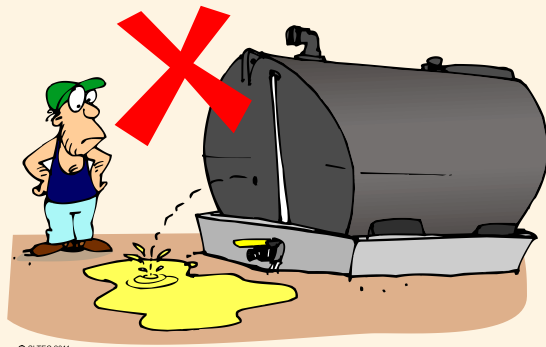

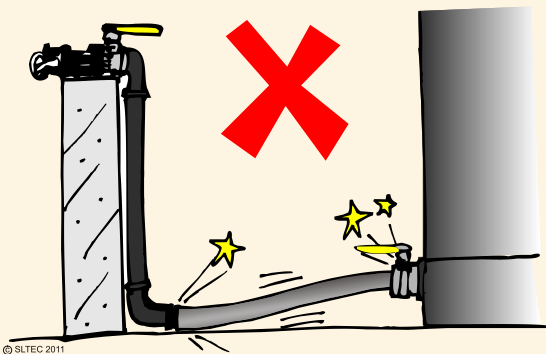
Best Practice Fluid Fertilizer Storage

Principle Risk Area	Best Practice Example	Description
Installing a flexible hose between the 2" or 3" Male Camlocks PLUS Valves and Pipe work On Top of the Bund Wall		Valve and pipe work should NEVER go through a bund wall. It should ALWAYS go over the top, thereby ensuring the integrity of the bund.
Installing a flexible hose between the Fertilizer tank and Pipe work or Manifold Systems	 <small>© SLTEC 2011</small>	Flexible hoses provide some ability for the pipe work to move with changing seasonal temperatures. Without flexible hoses the pipe work between the tank and the outlet can become ridged and break under extreme climate conditions.
Ladders and Walkways to Ensure Safe Access to Bunded Areas		Step Ladders and Walkways compliant with the Australian Standard (AS1657 – Fixed Platforms, Walkways, Stairways and Ladders) are recommended.
Fire Extinguishers		At least one portable 9kg AB(E) powder-type fire extinguisher should be readily accessible and adjacent to the storage area within 5 metres.
Cement Lined Sump System to Collect Water and Potential Spills. Sump Pump and Pipe work Also Installed		Sump systems in one corner or on one side of the cement bund system enables water and potential spills to be removed quickly and easily.
Bunded Cement Lined Unloading Areas		Bunded unloading areas enable any spills or losses of containment to be contained and recovered. The capacity of the bund, including the sump recovery system needs to contain 110% of the capacity of the largest compartment of the delivery truck. This will of course vary with different trucks but as a guide, most truck compartments are <10,000 L.

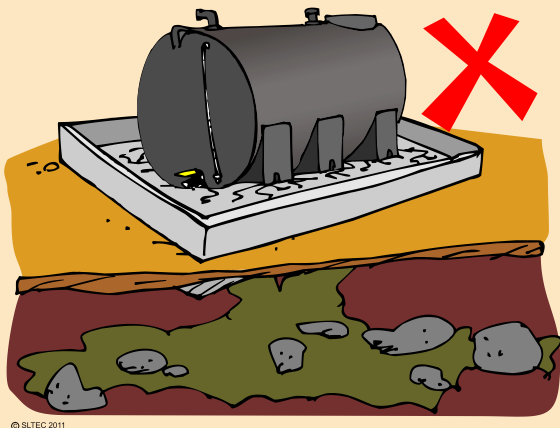
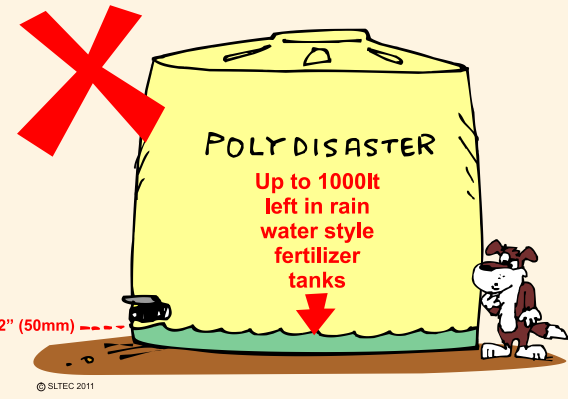

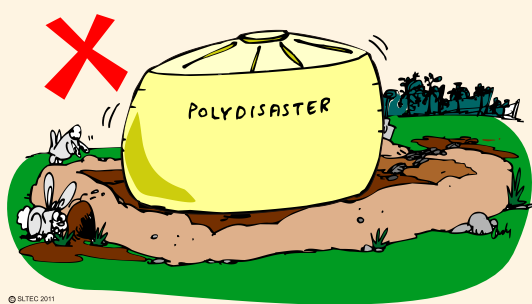
Best Practice Fluid Fertilizer Storage

Principle Risk Area	Best Practice Example	Description
Sight Gauges Installed on Bulk Fertilizer Tanks	 	<p>Sight gauges can either consist of a float and pulley system or a clear tube system running up the side of the tank.</p> <p>Where a clear tube is installed be sure to install a stainless steel ball valve at the base of the tank before the flexible hose to enable isolation. Ensure this valve remains closed at all times other than when you are checking the tank levels – this will protect the tank contents in the event that something happens to the flexible hose in your absence.</p>
Install a Sump in the Corner of the Bund		<p>Installing a sump when building the bund floor and walls enables an easy point for any rain water and any spills of fertilizer to be easily collected. Ensure the bund floor slopes gently to the sump. Installing a steel grate over the sump is also recommended.</p> <ul style="list-style-type: none"> • Install a blind sealed sump as part of the bund floor • Use fire fighting pump to extract clean water from bunds • Dispose of contaminated material responsibly
Half Height Rule in Bund Wall Design		<p>Where fluid fertilizers are rated as Dangerous Goods, the ½ height rule should be applied to storage bunds with a minimum separation distance from the largest tank to the “inner” edge of the bund wall being ½ the height of the tank (including floor mounts and support structures).</p>
Impervious Membranes Joining Walls to Floors in Bunds		<p>When joints are used in concrete or masonry systems, they should be sealed with a suitable sealant material that is impervious to, and compatible with, the fluids to be contained.</p> <p>The Supercast range of PVC waterstops are examples worth considering.</p>

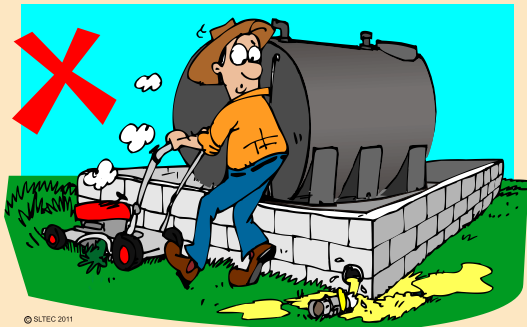

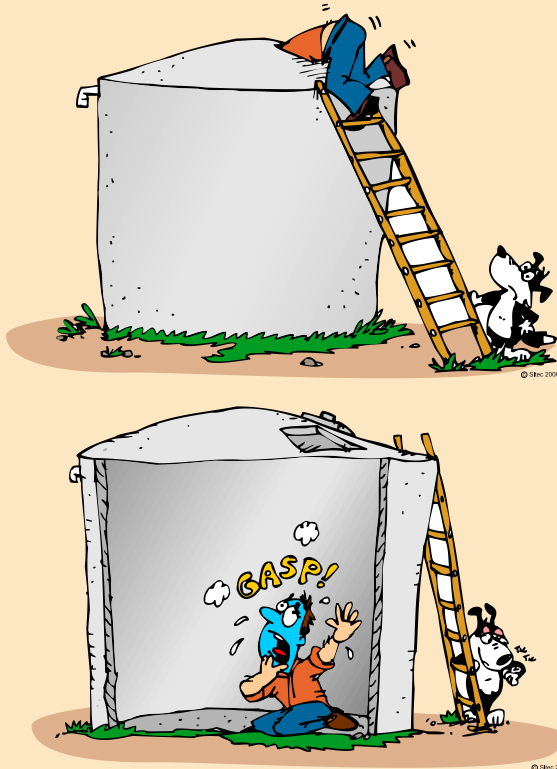
Inadequate Fluid Fertilizer Storage Practices

Principle Risk Area	Best Practice Example	Description
Unsafe Creek, River and Drain Crossings & Road Surfaces		<p>Unsafe crossings posing risks to drivers, tankers, the products carried and the wider environment.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Well maintained road surface areas Engineer design and constructed bridges fit for purpose
Inadequately sized bund for Above Ground Tanks on Stands		<p>A common mistake in designing bunds for above ground tanks involves forgetting to allow for the ½ height rule, leading to bunds providing inadequate protection against leaks from the tank vessel or associated pipe work.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Use the ½ height rule when designing tank bunds
Housekeeping and Waste Management		<p>Storing of agricultural chemical drums, sump oil, fuel and other incompatible chemicals/dangerous goods inside or around fertilizer storage areas</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Regular inspection of area
Installing of in-flexible pipework between the Fertilizer Tank and Manifold Systems		<p>Flexible pipework prevents the pipework from moving with changing seasonal temperatures. Without flexible hoses the pipework between the tank and the outlet can become ridged and break under extreme climate conditions.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Install a flexible reinforced hose between the tank outlet valve and the manifold or rigid pipework. Regular inspect the condition of pipework, especially following extreme temperature/climatic condition changes

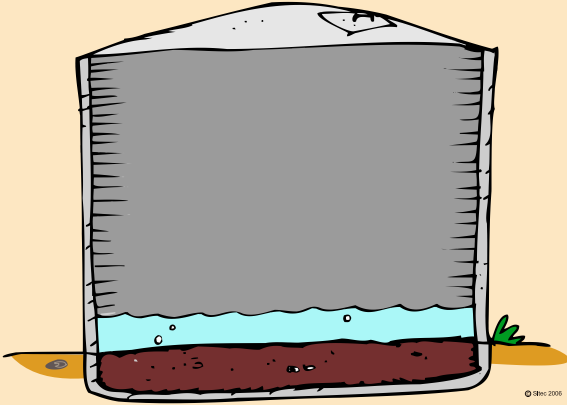
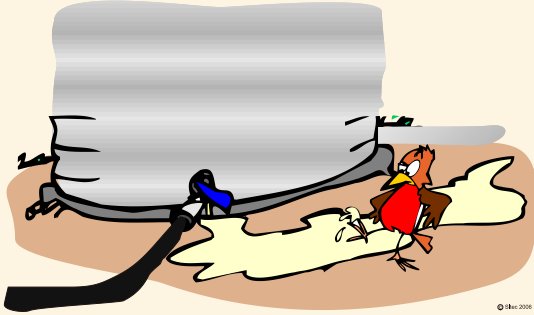


Inadequate Fluid Fertilizer Storage Practices

Principle Risk Area	Best Practice Example	Description
Inadequate bund floor footings and reinforcement	 <p>© SLTEC 2011</p>	<p>Cracks and fatigue of bund floor resulting from inadequate design and defective materials, leading to leaks of fertilizer and water through floor of bund. Possible impacts to soil and ground water.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Ensure footings and concrete slab base are designed and reinforced to cope with the load requirements of a full tank
Bulk Fluid Fertilizer Tanks without Sump Drain System	 <p>© SLTEC 2011</p>	<p>Rainwater style fertilizer tanks don't enable the last 40 to 50 mm of fertilizer to easily be drained from the tank. This can lead to issues such as accumulation of sludge and organic residues. Also in the event that a change in the type of fluid fertilizer occurs at some point, then if the tank can't be drained and cleaned, incompatible products may lead to precipitates and create major issues.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Utilise bulk fertilizer tanks with drainable sump systems
Storing and mixing fertilizers in Unbunded Areas	 <p>© SLTEC 2011</p> <p>© 18th Nov 2008</p>	<p>Storage and mixing of fluid fertilizer in unbunded areas can lead to surface water, ground water and land contamination issues.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Ensure fertilizer storage and handling areas are bunded and contained
Earthen Bund	 <p>© SLTEC 2011</p>	<p>Earthen bund with variable porosity leading to an inadequate containment of spilled fertilizer</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Construct reinforced concrete bund which has a high integrity

Inadequate Fluid Fertilizer Storage Practices

Principle Risk Area	Best Practice Example	Description
Cracks Occurring in Bund Walls		<p>Use of bricks and besser cement blocks might save time but cracks and fractures often occur leading to ineffective bunded areas. Impacts to soil, surface and ground water etc. Avoid putting pipework through bund walls.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Existing brick/besser block bunds can be lined with a water-proof sealant or an impervious liner Build new bunds out of reinforced concrete Install steel cement filled bollards around outside of bunded area to provide protection from collision with vehicle traffic Any pipework should go over the top of bund walls and not through them.
Top Filling Tanks		<p>Top filling tanks is an unsafe practice and presents unacceptable risks to the driver.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Install bottom filling 2 or 3" male camlocks
Confined Space Entry		<p>Fertilizer tanks are confined spaces and should never be entered without the appropriate confined space entry permit systems, a risk assessment, respiratory systems etc.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> Avoid entering fertilizer tanks Never allow incompatible fertilizers to be mixed in fertilizer tanks – thereby avoiding sludge buildup.

Inadequate Fluid Fertilizer Storage Practices

Principle Risk Area	Best Practice Example	Description
Sludge from Incompatible Fertilizer Products		<p>Some fluid fertilizers were never meant to mix.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> • Always ensure Calcium (Ca) based fertilizers are never mixed in tanks or pipework with products containing Phosphorus (P) or sulphur (S) • Have separate dedicated tanks for incompatible products. Ensure tanks are clearly labelled.
Fatigue and Failure of Tank Fittings		<p>Fluid fertilizer is corrosive and can make plastic tank fittings brittle over time and subject to fatigue and failure.</p> <p>Never allow brass or mild steel fittings to be used on tanks or pipework associated with fluid fertilizers.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> • Use Banjo poly fittings
Rain Water Tanks Under Rated for Heavy Fluid Fertilizers	 	<p>Fluid fertilizers are heavier than water. They can weigh between 1.2 and 1.5 kg/L typically. Hence fluid fertilizer tanks need to be build to withstand the substantial hydrostatic pressures resulting from the storage of fertilizer.</p> <p>Action/Alternative;</p> <ul style="list-style-type: none"> • Ensure the fertilizer tanks you buy are rated for at least a specific gravity of 1.5 kg/L

Fluid Fertilizer Storage Systems

The team at SLTEC® have conducted extensive research into storage and handling systems and can assist you to design and implement your liquid nutritional program.

Well designed fluid fertilizer storage and injection systems are essential to ensuring your fluid inputs are effectively utilized, to maintain your workforce safety and to minimize environmental impacts.

SLTEC® Fluid Fertilizer Tanks

(Rental Plans available)

Free Standing 32,000 L Tank

Poly Tank complete with:

- Manhole & safety lid
- Banjo fertilizer resistant fittings
- 3" camlock infill / outlet and air vent assemblies
- Stainless steel sight gauge assembly
- Bottom sump & 1" drain valve enabling 100% drainage
- Strong poly base to support and fittings



Free Standing 10,000 L Tank

Poly Tank complete with:

- Manhole & safety lid
- Banjo fertilizer resistant fittings
- Sight gauge 3/4"
- Tank height is designed to fit under Centre Pivot centre



Header Tanks for Liquid Run Fertilizer

- Poly tank and lid
- Stainless steel float assembly with poly ball float
- 1" fertilizer resistant camlock fittings with hose supplied



Fertilizer Injection Pumps

- Triangle Multifertic Electric Fertilizer Injection Pumps
- Standard pump 60MF-200 (200 ltr/hr single piston head)
- Standard motor 3 Phase
- Flow Rate adjusted manually from 0-100% via thumb wheel





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