



INDUSTRIAL PLASTICS

Thermoplastic and Dual Laminate CYLINDRICAL Tanks

Manufacturer's Customer Instructions For:

- Transport
- Loading / Un-loading
- Storage
- Installation
- Set up / Assembly
- Maintenance / cleaning

| | |
|-----------------------------------------------|---|
| 1 Transport: | 2 |
| 2 Loading / Unloading: | 2 |
| 2.1 Delivery Inspection | 2 |
| 2.2 General handling precautions | 2 |
| 2.3 Forklift handling precautions | 2 |
| 2.4 Use of crane / cranes | 2 |
| 3 Short Term Storage | 3 |
| 3.1 General storage precautions | 3 |
| 3.2 Venting | 3 |
| 3.3 Outside storage precautions - wind | 3 |
| 3.4 Outdoor storage precautions – UV exposure | 4 |
| 4 Installation: | 4 |
| 4.1 Foundations | 4 |
| 4.2 Anchoring | 4 |
| 4.3 Floatation precautions | 4 |
| 4.4 Clearance considerations | 4 |
| 5 Set Up / Assembly: | 4 |
| 5.1 Pipe work: | 4 |
| 5.2 Anchor bolting: | 4 |
| 5.3 Nozzle bolting: | 5 |
| 5.4 Ventilation | 6 |
| 5.5 Attachments | 6 |
| 5.6 Pre-use inspection | 6 |
| 6 Cleaning: | 6 |
| 6.1 For routine cleaning of tanks: | 6 |
| 6.2 Internal cleaning of tanks: | 6 |
| 6.3 Pressure spraying | 7 |
| 7 Maintenance: | 7 |
| 7.1 External inspection | 7 |
| 7.2 Internal inspection precautions | 7 |
| 7.3 Surface treatment | 7 |
| 8 Change of use: | 8 |
| Appendix 1 | 9 |

1 Transport:

Transport of tanks should be done by freight companies that have the suitable technical experience, appropriate equipment and trained and experienced staff.

- Tanks must be prepared for transport in such a way that addresses any risk of damage when loading, transporting and unloading
- The transport vehicle loading bed must not create any impact or compression forces on the tank such as those that may result from sharp edges or differences in trailer level. Abrasion must also be avoided.
- The tanks must be secured against movement during transport. The tie down methods must not damage the tanks and webbing slings or ropes should be used.
- Chains and wire ropes must not be used to directly secure tanks.
- Nozzles and connections must not be used as tie down points for transport.
- Supporting bracings or brackets should be padded or carpeted.
- At least one nozzle or vent must remain uncovered for pressure ventilation.

2 Loading / Unloading:

2.1 At the destination and before off-loading, the tank should be visually inspected and any damage noted must be recorded. Photographic records should be used where possible.

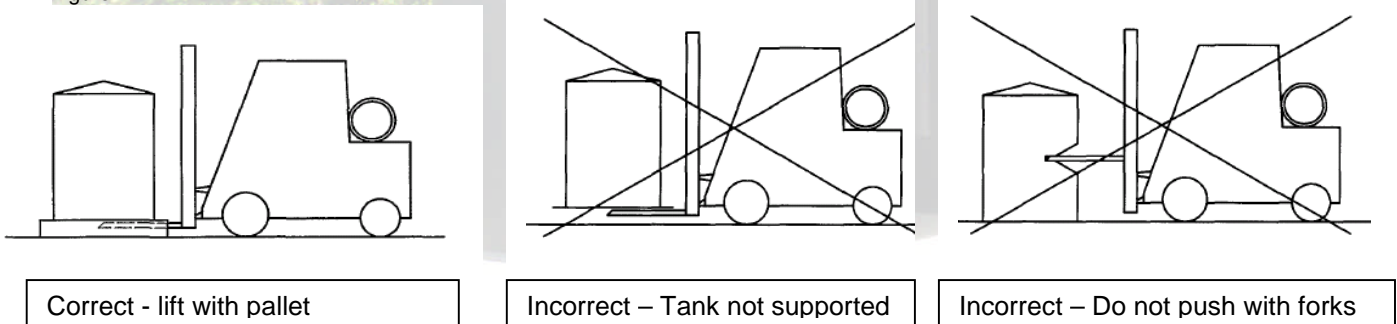
2.2 Shocks and impacts must be avoided when lifting, moving and setting down the tank.

- Tanks must not be rolled or dropped onto the ground from trucks.
- Tanks must not be rolled over connecting fittings, flanges or tie down points and should not be dragged along the ground.
- Tanks must be placed on a solid flat base.

2.3 There are different methods for loading and unloading tanks depending on their size.

- Appropriately sized forklifts with suitable load capacity may be used to lift small tanks that are firmly secured on skips or pellets. See Fig. 1

Figure 1

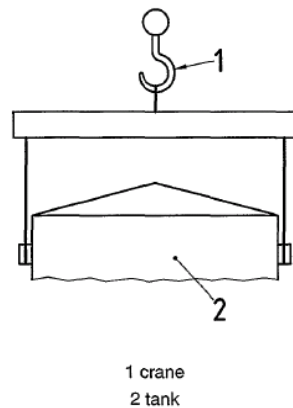


- Larger tanks will normally require the use of an independent or vehicular mounted crane.
- For tanks $> 30\text{m}^3$ or $> 4000\text{m}$ high, two cranes are recommended (see Appendix 1 for examples of lifting methods).

2.4 When using a crane or cranes to lift tanks:

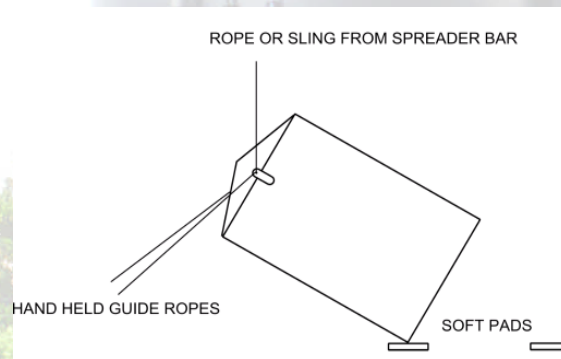
- The lifting lugs designed for this purpose must be used and a lifter or spreader beam rated adequately for the load must be utilised (Fig. 2) Spreader beams avoid stressing the cylinder walls and also prevent the damage that can be done to tank roofs by central lifting slings. Spreader beams must be capable of the load.

Figure 2



- Where a lifting beam is not available a single webbing strap (minimum 75mm wide) with a choking action, can be positioned around the tank cylinder approximately $\frac{1}{3}$ rd down from the top and used to lift the tank. Care must be taken to ensure it is kept tight during the lift and nozzles or other connections in the cylinder are not strained by it. **This method must not be utilised for rigid PVC tanks.**
- When using one crane to lift vertically from horizontal to vertical position, care must be taken not to allow the tank to swing and impact against anything that may damage it. Guide ropes are recommended
- It is especially important to avoid excess stress being loaded onto the base to cylinder weld when the tank is being rotated from a vertical position to a horizontal position (or visa versa). The practice of using the tank base as a fulcrum should be avoided if possible. Where this is not possible padding should be utilised to reduce stress. See Fig. 3

Figure 3



- Lifting thermoplastic and dual laminate tanks in temperatures less than 5° C should be avoided where possible unless temperature related affects, such as increased rigidity and decreased impact strength of the material properties, have been taken into special consideration.
- Tanks must always be empty when lifted as lifting lugs have been designed for tank load only. The impact of local wind on the tank during the lift should also be considered.

3 Short Term Storage

- 3.1 If necessary to temporarily store the tanks prior to installing, precaution must be taken to ensure they are stored safely:
 - They must be placed on firm level ground that is free from protrusions, sharp stones or ridges that will create loads on the base.
 - Vertical orientation is preferred, but if stored in a horizontal position then ensures adequate support through use of saddles or supporting timber or planks. The tanks should rest on those points where the roof/base connects to the cylinder.
- 3.2 Tanks must be adequately vented at all times – they are not designed to tolerate vacuum or pressure conditions.
- 3.3 When stored outdoors the tanks must be protected against impact damage and the effects of high winds.
 - If strapping down temporarily, nozzles must not be subjected to loads.

- Tanks may be partially filled with water to assist in securing them from wind effects but it is important that they have been completely emptied prior to being lifted for re-location. Lifting lugs have been designed for empty tank loads and also residual water may react with chemical contents.

3.4 Outdoor storage is not suitable for all tanks. Some are made of plastics that are not UV tolerant (PP, natural HDPE, rigid PVC) If a tank designed for inside use is to be stored outside please contact Industrial Plastics for recommendations

4 Installation:

4.1 Customer is to ensure tanks are installed on a suitable foundation designed to withstand the required loads.

- Flat bottomed tanks: must be installed on a clean, smooth, level, continuous surface that has been designed to withstand the required loads e.g. a concrete base.
- Skirt support tanks: entire circumference of the tank's skirt supports must rest on a level rigid foundation plate designed to support the required loads.
- Tanks with open grid bottom: it is important that all of the ribs are fully supported. When a leveling compound is used for tanks with an open grid base, a rigid base plate must be placed between the tanks and the applied compound to prevent the ribs from being wedged in.
- Tanks with feet: all of tank's feet must be set up fully on a rigid base plate and securely anchored. If necessary, the legs may be shimmed using a load-bearing material to ensure that the tank is uniformly supported in a level position.

On uneven foundations or in case of uneven tank or vessel bottoms, a fresh bedding material of sufficient thickness shall be used to ensure contact between the foundation and the tank bottom. Care must be taken to ensure tanks are correctly supported and no unstable material is placed between the tank base and the installation surface (e.g. sand) as the gradual loss of this layer will create uneven stressing of the tank base.

4.2 Anchoring: Any anchoring of tank must be done using bolt down points as fabricated, or attachments as specified in design. Where tanks are installed in a collection tank, the collection tank may need to be anchored.

4.3 Where applicable, tanks must be protected from risk of flooding and floatation. Bunds should be kept empty.

4.4 Clearance

- Sufficient clearance between the tank and walls and other constructions should enable for routine visual inspections to be done as per any maintenance schedule requirements.
- Impact protection (such as bollards) may be considered where tanks are located close to areas of traffic.

5 Set Up / Assembly:

5.1 Pipe work:

- Pipe work must be correctly aligned and connected in a way that no additional external loads are exerted on the nozzles or the tank. i.e. flexible couplings, compensators or expansion bends should be utilised. Allowance must be made for expansion of the tank e.g. due to normal variations in ambient and process temperature
- Standing on tank nozzles or piping that is attached to nozzles is not allowed and connections and piping should be protected from impact.

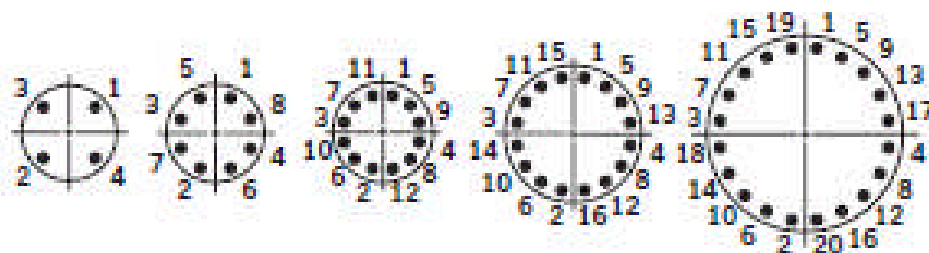
5.2 Anchor Bolting:

- Anchor bolting work shall be carried out as per design requirements.
- Torque: nuts shall be tightened until they reach the contact surface. All nuts shall be locked by a counter nut.

5.3 Nozzle bolting:

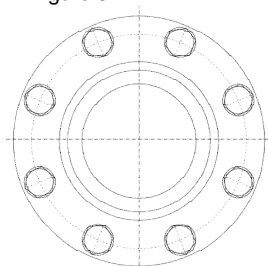
- Opposite lying bolts shall be tightened in pairs.
- Any following pair of bolts shall be selected at the widest angle to the axis of the previous pair. See the bolt tightening sequence (figure 4)

Figure 4



- Where horizontal nozzle connections exist, the bolt alignment in figure 5 is recommended as the contents of the tank would not run directly over the connecting bolts if there were any leaks at the flanged joint.

Figure 5



NOTE:
Alignment of the bolts
outside both the main axes.

- Washers must be placed at the nut as well as the bolt head.
- An anti-seizing agent (e.g. molybdenum sulphide) should be applied to the thread and all friction faces to aid smooth tightening (and later loosening) and must be used for stainless steel bolting.
- Bolt torque required is that necessary to establish a seal. **The influence of the thermoplastic material as well as ambient and operating temperature may mean that re-checking and re-tightening is required after commissioning.** For a guide to upper limits of torque allowed, using elastomer seals (i.e. EPDM, CSM or FPM) see Table 1.

Table 1. **Upper** limit torque guidelines using **elastomer** seals based on recommendations from German DVS 2210-1 technical code: May 2006 **zul p** = permissible operating overpressure

| DN (mm) | Bolt Tightening Torque Guide (Nm) | | |
|-----------------------------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|
| | Flat ring (zul p ≤ 10 bar) | Profile gasket (zul p ≤ 16 bar) | O-ring gasket (zul p ≤ 16 bar) |
| 15 | 15 | 10 | 10 |
| 20 | | 15 | 15 |
| 25 | | | |
| 32 | 20 | | |
| 40 | 30 | | 15 |
| 50 | 35 | | |
| 65 | 40 | | |
| 80 | | | |
| 100 | | | |
| 125 | 50 | 30 | 25 |
| 150 | 60 | 35 | 30 |
| 200 | 70 | 40 | 35 |
| 250 | 80 | 50 | 40 |
| 300 | 100 | 60 | 45 |
| 350 | 100 | 70 | 50 |
| 400 | 120 | 80 | 60 |
| 500 | 190 | 90 | 70 |
| 600 | 220 | 100 | 80 |
| Shaded areas = permissible operating overpressure ≤ 6 bar | | | |

NB: DVS2 2210-1 suggests that where good bolting technique is used (ideally torque wrench), leak proof seals might be achieved using only approximately 80% of suggested values

5.4 Ventilation

Tanks are not designed to be pressurised or subjected to vacuum other than that which may occur during the transfer of fluids in their normal operation. A patent ventilation system is critical for safe operation of the tanks and this must be ensured prior to use. It is important that:

- It must not be possible for vents to be closed or blocked off (beware natural hazards – see maintenance guide).
- If connecting to ventilation systems, filters, seal pots etc, these must not impair venting effectiveness and must not allow either increased pressure or vacuum to develop in the tank above that permitted.
- Possibility of fumes venting to an interior environment must be assessed for possible OH&S risk – refer to MSDS of contents.
- If tanks are vented to a shared line then the potential hazard of mixing fumes must be assessed.

5.5 Attachments

- Any components that have been approved to attach to the tank (fill level indicators, etc) must not restrict the ability of the tank to expand and contract.
- Any additional equipment generating vibrations (pumps stirrers etc) should be installed on the tank with appropriate dampening devices.

5.6 Inspection

Prior to use the tank should be inspected to ensure:

- The tank is completely empty, clean and free from any foreign objects. In some cases the required use will mean that it is important to make sure the interior of the tank has been dried of water.
- There has been no damage caused during installation. Visual inspection should note general state of the tank and tank surfaces. Impact damage, dents, gouges should be noted (photographed where possible) and any damage reported to Industrial Plastics for recommendations.
- The ventilation system, the overflow system and the filling level indicators are all working correctly.

6 Cleaning:

6.1 For routine cleaning of tanks:

- Bleach (sodium hypochlorite) should be avoided.
- Use water with the addition of mild soap or detergent if necessary ($\leq 50^{\circ}\text{C}$).
- Avoid organic solvents or harsh chemicals that may cause plastic to swell and increase the likelihood of stress cracking.
- Make sure that ANY cleaning solution is thoroughly rinsed off with water as long term exposure to detergents can undermine the integrity of plastic over time.
- Plastic scrapers or non-scratching scouring pads can be used but avoid damaging the tank.
- Do not use metal scrapers or wire brushes.

6.2 Internal cleaning of tanks:

- May require the adoption of confined space management protocols and this must be managed by appropriately authorised persons only.
- All occupational health and safety requirements must be met, especially those relating to taking the tank out of service and dealing with chemical hazards.
- Prior to cleaning tanks must be emptied completely and care must be taken not to damage the tank through impact or local loads being created via ladder bases, tools being dropped or personnel moving heavily in tank, etc. This is particularly important for rigid PVC tanks.

- Residual solutions can be removed with a binding material such as sawdust, absorbent pads or similar (consult MSDS).
- Where tanks store a chemical that reacts with water in an exothermic manner that will generate heat, it is particularly important that the tanks are completely empty prior to cleaning. As an added precaution, access to high volume water dousing methods such as a large volume hose (>50mm diameter) should be available to reduce any reaction heat if this occurs.
- Warm water (up to 10°C higher than usual operating temperature) can be used to fill the tank and be allowed to soak for several hours to assist with the softening of water soluble deposits if required.
- Plastic scrapers or non scratching scouring pads can be used, but it is important to avoid damaging the tank surface. Metal scrapers and wire brushes should not be used.
- If cold water is used to wash or rinse out the tank, the temperature of the tank surface should not exceed the water temperature by more than 20°C.

6.3 Pressure spraying

Pressure spraying may be used to clean the outside or inside of the tank, but it is important to avoid exposing the tank surface to concentrated high pressure forces. This can be achieved by using a fan spray nozzle and directing the jet at an angle onto the tank where possible, and avoiding contact with the tank surface by a margin of approximately 150mm. The nozzle pressure should not exceed 150 Bar. Cleaning fluid temp ≤50°C

7 Maintenance:

Correctly selected thermoplastic tanks should provide many years of trouble free service. Routine maintenance requirements are minimal, though regular visual inspections of the tank, tank foundations and attachments are prudent as part of any preventative maintenance program.

Inspection intervals chosen should depend on a risk assessment considering tank contents, volume, location, hazard potential and service life.

7.1 Routine external visual inspection should include checking:

- General state of the tank and tank walls. In particular the area where tank cylinder and base meet, nozzles, manhole attachments and support structures for piping and valves.
- Venting systems are working correctly. Vents should be covered with screens to prevent vermin / insect incursion and need to be checked regularly to prevent any loss of effectiveness due to cobwebs, leaves, dust, frost etc. Similarly the possibility of chemicals crystallizing and obstructing vent must be addressed.
- Inspections should also check that any bunds are empty and that bolts are tightened correctly.

7.2 Where internal inspections are undertaken:

- Additional precautions must include those relating to occupational health and safety regulations relating to possible confined space entry and the removal of tank from service prior to entry.
- Care must be taken not to damage the tank through impact or local loads being created via ladder bases, tools being dropped or personnel moving heavily in tank etc. This is particularly important for rigid PVC tanks.

7.3 Surface treatment

- Polyethylene, polypropylene and dual laminate tanks do not require painting.
- Solvents in some paints may adversely affect the plastic. Poor adherence of paint may also present a problem. Where painting is required, only those paints which do not have a detrimental effect on the tank material may be used (e.g. solvent free emulsion paints).
- Self adhesive marking tapes may be used as long as the same restrictions apply to the adhesive as those that apply to paints (e.g. the adhesive must not damage the tank material).

8 Change of use:

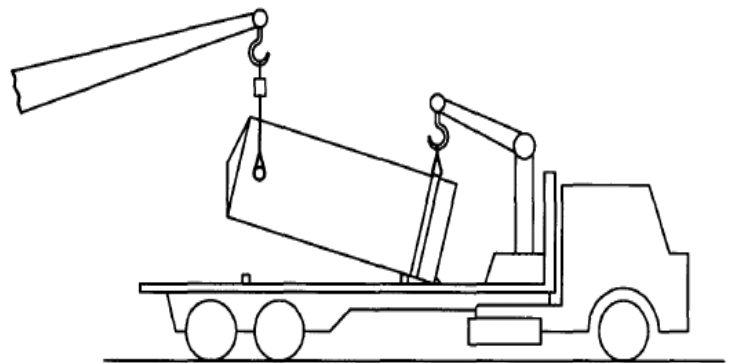
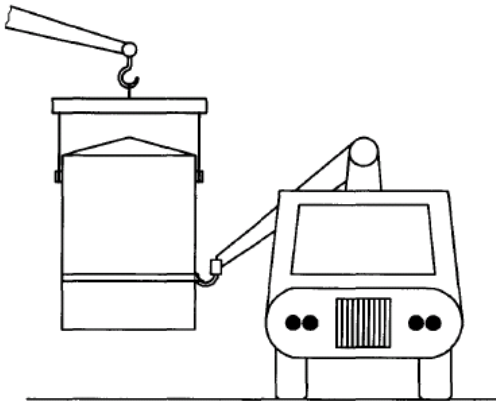
Industrial Plastics produces tanks that are custom designed to contain specific substances under specified operating conditions. **Under no circumstances should the tank contents or working conditions of the tank be altered without seeking further clarification from Industrial Plastics.**

Disclaimer: The instructions attached have been compiled to suggest methods for the transport, installation, maintenance and cleaning of custom cylindrical tanks manufactured by Industrial Plastics from polyethylene, polypropylene, rigid PVC and dual laminate GRP/PVC materials. Industrial Plastics does not claim that these instructions are exhaustive and customers must ensure that all local legal and statutory requirements are met.

Notes:

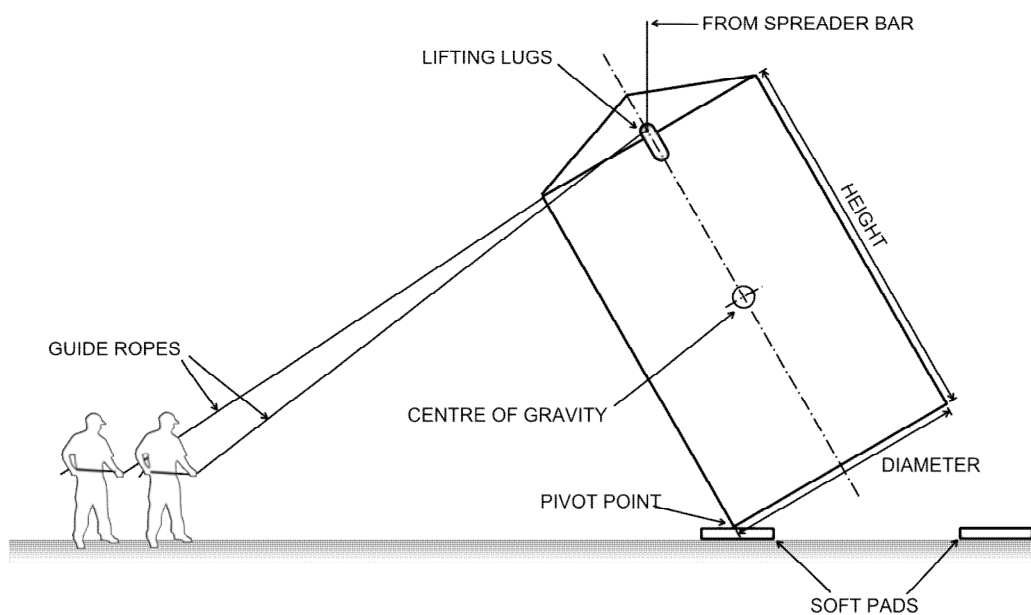
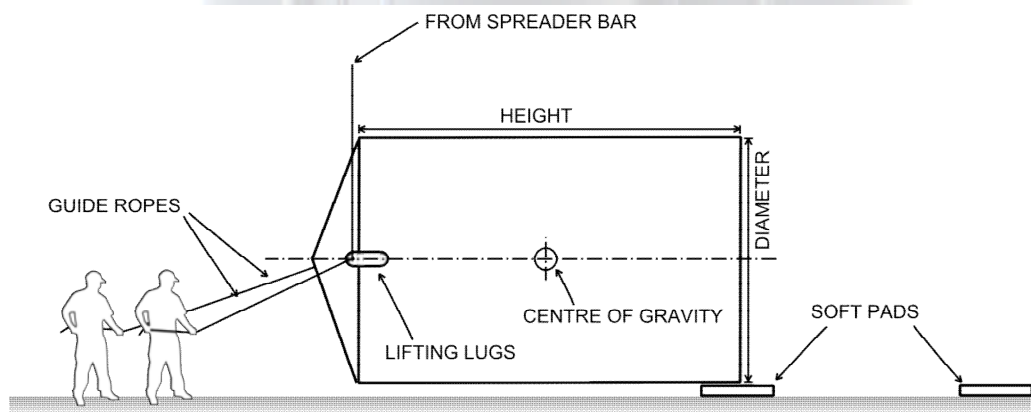
Appendix 1 Lifting methods

Examples: Methods of lifting tanks with cranes. **Professional service providers should be utilised.**



Above: Loading a large tank using two cranes - fabric strapping, placed approximately 500mm up from the bottom of the tank, is used to control the base of the tank.

Below: Example of one crane method with protection of cylinder to base join.



Below: Example of lifting method using two cranes. Guide ropes are recommended.

