WCS Environmental Engineering

MARLOWE Environmental Services

CONICAL

INSTALLATION OPERATION & MAINTENANCE MANUAL

Contents

Contents 1
1. HEALTH AND SAFETY 2
2. INTRODUCTION 2
2.1 In-ground and above-ground 2 and 3-metre tanks 2
2.2 In-ground 4, 5 and 6-metre tanks 2
2.3 Delivery 2
3. REQUIREMENTS 3
4. WORKING AREA 3
5. EQUIPMENT 3
6. 2 and 3m TANKS - ABOVE GROUND INSTALLATION 4
7. 2 & 3-METRE IN-GROUND CONICAL TANKS 5
8. 4, 5 and 6-METRE TANKS 7
8.1 Introduction 7
8.2 Installation Procedure 7
9. BRIDGE FITTING 10
10. CENTRE DRUM 10
11. WEIR BRACKETS AND ADJUSTMENT 12
12. MAINTENANCE OF CONICAL TANKS 13
12.1 Weekly Maintenance 13
12.2 Scum removal 13
12.3 Six Monthly 13
13. WARRANTY LIMITATIONS 14
14. NON-WARRANTY SERVICES 14

Revision History:

Date	Change description	Owner	Checked	Revision
01/07/2015	First issue	TC	TH	A
13/11/2018	Document revised and updated	TC	AB	B
24/01/2022	New Weir Adjustment detailed	TC	RT	C
15/09/2022	Details added to exclusions	TC	RT	D
17/11/2022	WCSEE REVISED	TC	BD	E
23/09/2025	REAR PAGE CHANGED	RT	TC	F

1. HEALTH AND SAFETY

United Kingdom Health and Safety at Work Act 1974

Section 6a of this act requires manufacturers to advise their customers on the safety and the handling precautions to be observed when operating, maintaining and servicing their products.

The user's attention is drawn to the following:

All the sections of this manual must be read before working on the equipment.

Suitably trained and qualified personnel must carry out installation.

Normal safety precautions must be taken and appropriate procedures observed to avoid accidents.

Refer to WCSEE for any technical advice or product information.

Civils contractors who excavate for an in-ground installation must ensure that the sides of the hole are stabilised to health and safety regulations for men working in a below ground excavation. Temporary barriers and warning signs should be erected around any open covers or manholes as appropriate, in particular warning of deep water in the tanks.

CAUTION: The tank as a whole and the petals in particular are susceptible to wind, therefore, assembly should not be attempted in any more than a very light breeze.

2. INTRODUCTION

This document covers the installation both in- and above-ground of 2, 3, 4, 5 and 6-metre conical tanks. In addition it demonstrates how to install bridges, walkways and handrails.

2.1 In-ground and above-ground 2 and 3-metre tanks

Delivered complete and ready for installation. The only exception to this is where the height is non-standard.

2.2 In-ground 4, 5 and 6-metre tanks

Delivered in sections for on-site assembly either by WCSEE engineers or contract engineers. The sections delivered comprise base cone, top- and mid-section petals and, where necessary, bridges, walkways and handrails.

2.3 Delivery

The customer is responsible for off-loading the tank sections and other items on site, and the safe storage until assembly. WCSEE, or the customer's contractors, will assemble tanks over three metre (3m) on site. Lifting required during assembly is to be provided by the customer. Lifting and positioning of the assembled tank into the excavation or onto its above ground location is the responsibility of the customer.

3. REQUIREMENTS

Assembly and placement should only take four (4) working days, excluding backfilling. In order to successfully complete installation a number of requirements are necessary

4. WORKING AREA

Assembly can take place on level ground adjacent to final site. A minimum flat area of one metre larger than the tank diameter is required, along with a working clearance outside this for a scaffold tower or similar as required. Where a bridge is to be installed, access to both ends of the bridge will be needed for placement onto the tank. If the site does not have a suitable flat area contact WCSEE.

5. EQUIPMENT

The following list of equipment and requirements cover the entire range of conical tanks

- Normal construction equipment and plant.
- Crane or other lifting equipment for duration of assembly and placement with operator.
- Props or acrows and packing material.
- Minimum of 3 workmen.
- An adequate supply of water capable of keeping pace with the rate of concrete backfilling.
- Pumping equipment where necessary.

NOTE: In extreme circumstances installation can take place insitu. This is subject to a full site evaluation by WCSEE engineers.

6. 2 and 3m TANKS - ABOVE GROUND INSTALLATION

1. For above-ground installations, lay concrete with a **MINIMUM** of 3.5m diameter in centre of tank location. Ensure it is level and leave to set.

2. Set up the tank in centre of area on steel frame supplied in final position **ensuring orientation is correct for frame and pipes etc**. Level with the jacking screws provided or wooden wedges as required. Bolt the 4 additional support legs onto the tank with the bolts supplied and level these legs with the jacking screws provided or wooden wedges as required. Grout under the flanges on the bottom of all the legs and when set drill for concrete anchors and bolt in position.

Note: The frame on the base cone is only to provide stabilisation; the main weight of the tank should go through the base of the cone.

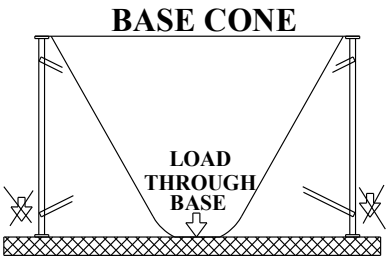


Figure 1. Stabilisation Frame and Load Path Diagram

3. Check the tightness of all tank bolts to ensure none have loosened during transport. Torque for Silo bolts on rim of base cone is 50Nm (35 lb/ft) and the bolts through metal clamp bars is 65Nm (48 lb/ft).

Note. The tank may creak a little when filled with water but this is normal. The tank joints are over laminated internally to prevent leakage.

4. Bolt the ladder in place on the side of the tank grouting up to the feet as required and using concrete anchors.

7. 2 & 3-METRE IN-GROUND CONICAL TANKS

Installation Procedure

Calculate the amount of backfill required. THIS IS VERY IMPORTANT. A qualified civil engineer must be consulted to determine the correct grade of concrete. Lean mix or dry mix concrete must be used to backfill the excavation. However, prevailing local ground condition may override this requirement. If wet mix concrete is to be used, further consultations with a civil engineer may be required. Note: the pour cannot take place in a single operation. Contact WCSEE for further information.

1. Excavate to required dimensions to allow sufficient backfill to suit local ground conditions.. The tank size is shown on the general arrangement drawing of the tank supplied.

2. Lay concrete for base, a minimum of 2.6m diameter, in the centre of the excavation, ensuring it is level and leave to set.

3. Position and level the tank on the concrete base. The frame legs have M16 adjusting bolts to assist in levelling the tank. The frame on the base cone is only to provide stabilisation; the main weight of the tank should go through the base of the cone.

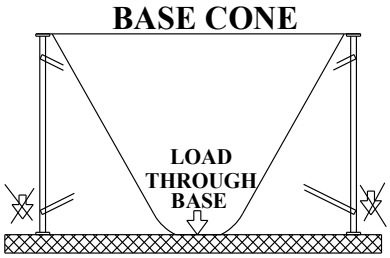


Figure 2. Stabilisation Frame and Load Path Diagram

4. Once the tank is positioned it is important to ensure water does not accumulate in the excavation as considerable damage could be caused by the resulting up thrust. This also applies if backfilling is completed in stages.

5. Before backfilling, ensure that an adequate water supply is available. Fill tank to a level of about 1.3m and cover unmade pipe connections.

6. Start to backfill with concrete at the same time as filling with water to keep the water level between 1.3m and 1.7m above the top of the concrete. Make sure you have read step 3 before starting.

7. When backfill is approximately 0.5m below the lowest pipe connection, stop backfilling, lower water level if required, and make pipe connections.

8. Continue backfilling as in step 6. The final depth of the concrete fill should be level with the top flange of the tank to allow the hand railing to be secured through the tank into the concrete.

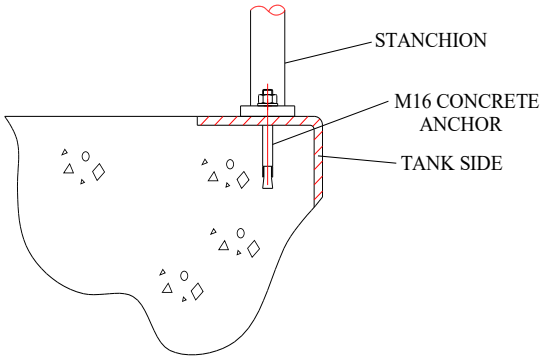


Figure 3. Hand Railing Connection Diagram

9. Having completed the backfilling, alter the water level so that it is only just beginning to flow over the weir.

10. Level the weir sections starting with the section that has the outlet in it and work round such that water flows over most of the "V" notches. Ensure that the nylon nuts are tightened firmly (they are not as strong as steel) using the lock nut to ensure that it is prevented from moving both up and down.

11. Assemble the hand rail into the stanchions before fixing the stanchions to the concrete, ensuring that the expanding joining pieces are inside the stanchion balls.

12. The stanchions are bolted down through the top lip of the tank or into the concrete using suitable M16 concrete anchors. (Not supplied)

8. 4, 5 and 6-METRE TANKS

8.1 Introduction

Tanks of this diameter are assembled in three sections, base cone, mid-section and top section. The base cone will arrive on site pre-built. Assembly of the other two sections takes place adjacent to the base cone and in a position such that the lifting device or crane can lift in the following order: top-section to mid-section, top- and mid-section to base cone and complete unit to the excavation.

8.2 Installation Procedure

1. Set up base cone in centre of area on steel frame supplied on level ground.

Ensure that the base of the cone is resting on the concrete as the frame is only meant to stabilise the cone and not support any great weight.

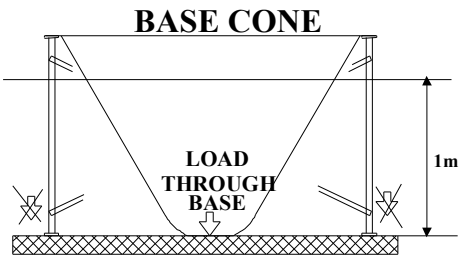


Figure 4. Stabilisation Frame and Load Path Diagram

2. Prepare mid-section 'petal' section for lifting. Ensure that the groove on the lip is clean and dry on both sides and apply a bead of gun grade polyurethane sealant to one side (see diagram in step 7. Sealing).

3. Lift first mid-section 'petal' section into position. Ensure that the vertical seam is over the base frame upright. Prop 'petal' in position with timbers or 'acrows'.

Figure 5. First Mid-section petal

4. Proceed to fit other tank petals, working with adjacent panels and lightly bolting up the petal to petal vertical joints as each petal is in place.

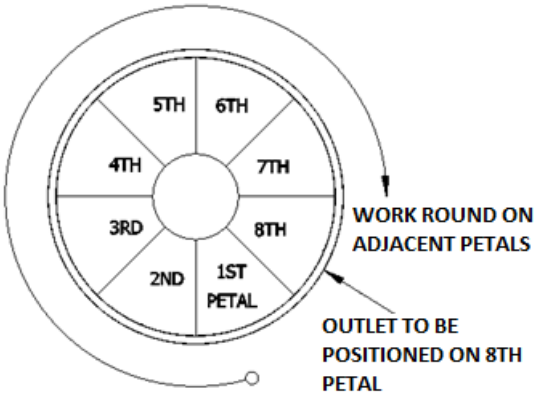


Figure 6. Petal Connection Sequence

5. When all sections are in place, check across the tank in two or three places and adjust jacking bolts and supports as necessary to make the tank level and circular to nominal diameter +/- 20mm internally. This is particularly important at the bridge position.

6. Tighten all bolts, torque for Silo bolts on rim of base cone to 50Nm (35 lb/ft) and the bolts through metal clamp bars to 65Nm (48 lb/ft).

Sealing

7. All tank joints have been designed to take a seal of gun grade polyurethane.

8. All joints must be kept dry during the sealing process. Apply the gun grade sealant into all grooves to form a continuous bead. At the top of each segment completely fill the groove and carry this sealant across the top flange, seal both sides of this flange.

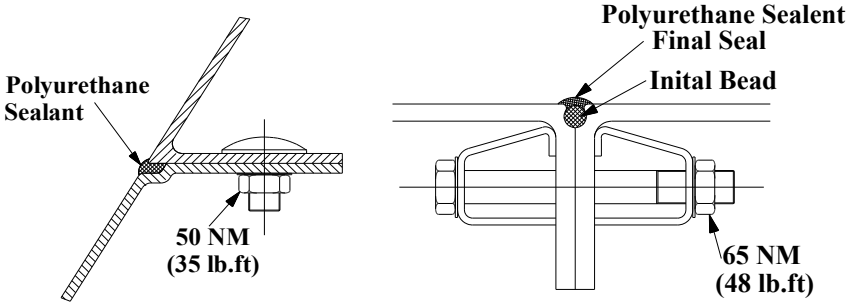


Figure 7. Sealant Locations

9. Allow at least 24 hours for the sealant to cure before allowing any hydrostatic pressure on the joints, either internally or externally. Surface moisture (not heavy rain) will not affect the sealant once in place.

10. Repeat steps 2-8 for the top section.

11. Weirs are best fitted before the bridge.

12. Fit Small Stainless steel brackets to the weir sections using pre-drilled holes - 3 per section. Bolt with M8 stainless steel fixing provided.

13. Fit with nylon studding to the Larger Stainless steel brackets to the **dimensions shown on the drawing**.
    Fit the studding approximately in the centre of the slots provided

Figure 8.

14. Starting with the weir piece with outlet sump, fit outlet pipe to socket in tank wall. Level the weir section and drill through the tank wall using the stainless steel brackets as a guide. Bolt brackets in place, just hand tight, using M8 stainless steel fixings provided.

15. When all 3 brackets have been attached adjust the nylon studding until the weir section is level. Remove fixings through the tank wall, take outlet pipe from fitting, apply solvent cement and re-fit. Secure mounting brackets to tank wall using gun grade sealant between bracket and tank wall.

16. Proceed with the rest of the sections ensuring they are level before moving on to the next using slotted adjustment as necessary.

. **NOTE: Final levelling is carried out when the tank is full.**

9. BRIDGE FITTING

Lift into place, check the diameter across the tank and drill through with a 16mm drill. Bolt in position using M16 X 70 bolts provided with the spreader plate or angle under the flange.

10. CENTRE DRUM

This is supported from the bridge, bolted directly to the underside of the lower angle members. Ensure Orientation of Scum and inlet Pipes are correct before drilling and bolting in position. Fit necessary scum and inlet pipework between top ring and centre drum.

Note: The following steps concern the assembly of the completed sections. This assembly, and installation into the excavation must take place without a break, i.e. on the same day.

1. Using the bridge, lift the top-section onto the mid-section. Clamp sections together, checking that the orientation is correct. Drill 13mm holes around the flange and then bolt together. Proceed to seal and bolt the units together without removing the lifting tackle.

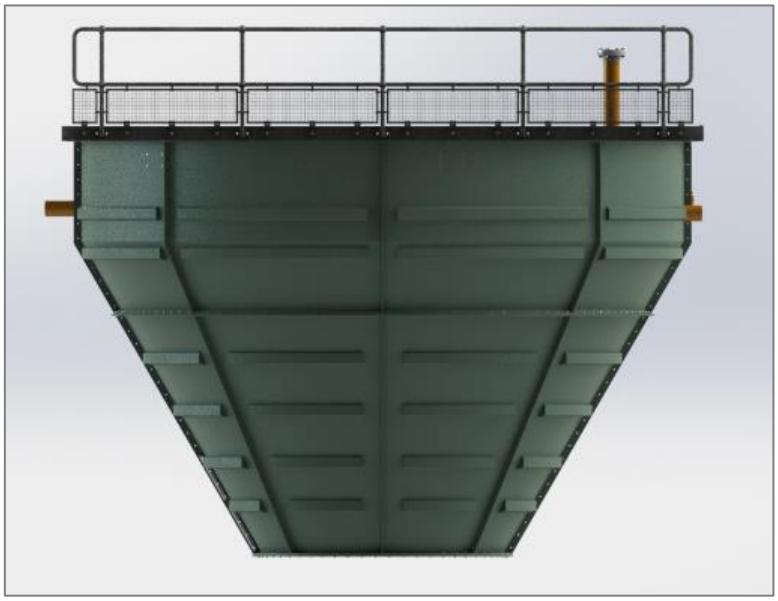


Figure 9. Addition of Top Petal

2. When the top- and mid-sections are bolted together lift the whole section onto the base cone. Do not remove the lifting tackle.

3. When all the sections are bolted and sealed together lift the whole unit into the excavation.

Figure 10. Completed Conical

4. Orientation and levelling is the responsibility of the customer. When this part of the procedure is complete WCSEE engineers, or the contractor's engineers, will complete the fitting, where applicable, of the sludge pipe. Fix and glue the de-sludge pipe into position and fix holding brackets.

5. Before backfilling ensure that there is an adequate water supply available and there is between 0.9m and 1.3m of water in the bottom of the tank. Cover unmade pipe connections.

6. Start to backfill with concrete at the same time as filling with water. Maintain the water level at between 1.3m and 1.7m **ABOVE** the top of the concrete.

7. When backfill is approximately half a metre (0.5m) below the lowest pipe connection, stop backfilling, lower water level if required, and make pipe connections.

8. Continue backfilling as in step 6. The final level of the concrete should be level with the top flange of the tank to allow the hand railing to be secured through the tank into the concrete.

9. Having completed the backfilling, alter the water level so that it is only just beginning to flow over the weir.

10. Adjust the weir sections starting with the section that has the outlet in it and work round.

IMPORTANT:

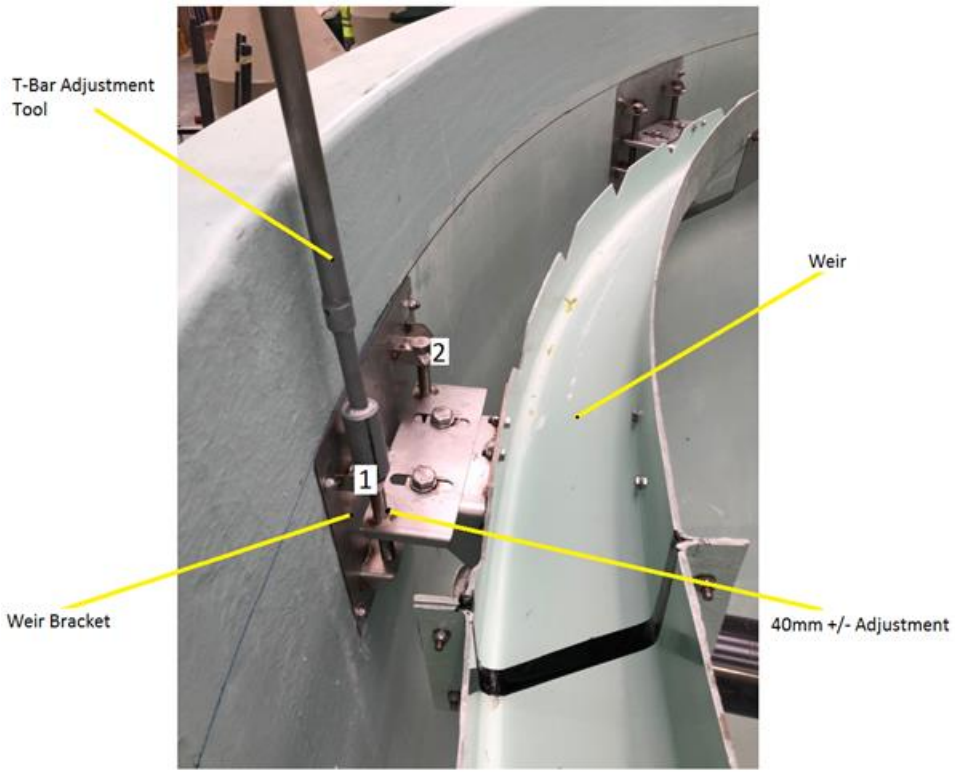
- **The silo bolts are 1/2" UNC galvanised.**
- **The other tank jointing bolts are M12 galvanised.**
- **All nuts and bolts below the water level internally to the tank are stainless steel.**

11. WEIR BRACKETS AND ADJUSTMENT

The Stainless Steel Weir Bracket features benefits by allowing the user to adjust the height of the weir up to a maximum of +/- 40mm.

It also allows free access to the top of the weir for cleaning and maintenance without the need to enter the tank.

The conical comes equipped with a T-bar adjustment tool where the site operator can adjust the height of each bracket from a safe distance behind the peripheral handrailing. It is important that the T-bar is chained to the handrailing before it is lifted over the handrailing, so that it can easily be retrieved if dropped.



Adjusting the height is done by the two M16 Bolts shown in locations 1 & 2 in the above image. It is advised to only turn each bolt, 1 full turn at a time, to avoid damaging the brackets and the weir. Repeat this operation on each bolt at a time on each bracket until you have the height you require the weir to get an even outlet flow.

Note:- The weir brackets closest to the outlet pipe should not be adjusted, as the outlet height is fixed into the GRP wall. The outlet pipe forms the start point where the weir should be adjusted from.

12. MAINTENANCE OF CONICAL TANKS

WCSEE conical tanks require very little maintenance. There are however a number of points that should be observed at all times with particular reference to Health and Safety.

Access to the site must be restricted. Conical tanks are by their nature deep and contain high volumes of liquid. Restriction should be by way of locks and chains. Additional security should be provided where a bridge is installed.

12.1 Weekly Maintenance

- Ensure the weirs are clean of debris and blockages. Where necessary clean with a non-metallic scraper. Check that the weirs are secure in position.
- Ensure the 'V' Notches are clean
- Ensure that the desludging is taking place at the scheduled times
- Check for floating sludge or scum and remove if present

12.2 Scum removal

Scum removal is best achieved by the central descum pipework (optional). This allows for effective scum removal via operation of a valve (supplied and fitted by others), which due to hydrostatic pressure, draws approximately the top 100mm of liquid and scum from the tank., into a separate sludge storage device.

Note. The descum valve must be closed after removing the surface scum to prevent overfilling of the sludge storage device.

12.3 Six Monthly

As for weekly maintenance but also include:

- Check levels
- Visually inspect the tank to ensure structural integrity of the system

IMPORTANT NOTE:

The conical tank construction does not permit the tank to be emptied at any time due to potential ground water pressures impinging on the side walls.

13. WARRANTY LIMITATIONS

The warranty period for this plant is 25 years for manufacturing defects. However, WCSEE shall not be liable for any labour involved for the removal or replacement of its equipment or the subsequent transportation, handling or packaging of any part or parts thereof. In no case will WCSEE be liable for loss incurred because of interruption of service or for consequential damages, labour or expense required to repair defective units, nor shall this constitute a cause for the cancellation of the contract of purchase and sale. Specifically exempt from this warranty are limited life of consumable components subject to normal wear and tear.

14. NON-WARRANTY SERVICES

Service charges will be incurred (including parts and labour), due to the following:

- Unauthorised alteration.
- Accidental damage, caused by plant or movement on site outside of WCSEE's control.
- Improper use.
- Abuse.
- Tampering.
- Failure to follow installation instructions or failure to follow operating and maintenance procedures.

The above will not be covered by WCSEE warranty. All service visits for non-warranty work are chargeable at the standard engineer day rate plus mobilisation. This warranty gives specific additional benefits. Statutory rights are unaffected.

WCSEE will not uphold the guarantee on the purchased equipment if the routine maintenance has not been performed and documented. WCSEE strongly recommends that the installation of the purchased product is carried out by a qualified and experienced installer. Dependent on the site a qualified civil engineer may need to be consulted for the construction.

WCS Environmental Engineering

MARLOWE Environmental Services

info@wcs-group.co.uk
wcs-group.co.uk/environmental-engineering
+44 (0)1454 299 310

Disclaimer
WCS Environmental Engineering (WCSEE) has a policy of continual product development and the above information may be subject to change without notice. WCSEE reserve the right to to change the specification in line with company policy of improvement through research and development. Errors and omissions excepted. Models shown in this manual may include additional cost options that are not part of the standard specification