

Vortex Installation Manual

The information contained within this Installation Guidance Manual is provided for general information purposes only and does not take into account any specific requirements resulting from your particular location and/or site, of which Water Technology Engineering Limited has no knowledge.

Whilst we endeavour to keep the information up to date and correct, we make no representations or warranties of any kind, express or implied, about the completeness, accuracy or reliability of the information contained within the Installation Guidance Manual.

Special attention should be paid to the siting of the tank as damage may be caused to the exterior as a result of inappropriate siting. We would advise that due to the wide variety of possible ground conditions, specialist installation advice should be sought from a suitably qualified professional as to the appropriate installation method for your particular location/site.

It is the responsibility of whoever is instructed to install the tank, to ensure that the installation method and materials used are suitable for the Tank and specific location/site conditions at all times of the year.

Water Technology Engineering Ltd do not accept liability for any loss or damage caused as a result of the customer's failure to ensure appropriate siting of the tank or of an unsuitable, inappropriate or incorrect installation.

When installing tanks on sites with unusual ground conditions such as high water tables, sloping ground etc. a civil engineer or suitable qualified person must be consulted to ensure that the guidance given below is suitable for the site.

Where the guidance below is not suitable for a specific site then a civil engineer or suitably qualified individual must be consulted to design a suitable installation procedure.

WTE recommends that its products are installed, or the installation works supervised, by WTE Approved Contractors.

The guidance given below is correct at time of publication but may vary due to continued product development. Please check to make sure you have the most up to date installation guidance.

Installation Record Sheet

Once completed, a copy of this sheet must be returned to WTE either by post (WTE Ltd, Unit 2, Bolton Lane, York, YO41 5QX) or email (sales@wte-ltd.co.uk).

All boxes must be filled in (pump serial number only applies to tanks with an effluent pumping station) in order to validate the warranties.

Installation refers to the tank's physical placement, backfilling and electrical connection.

Commissioning refers to the setting up of the system – air blower(s), sludge returns, aeration, etc.

Both installation and commissioning are covered in the installation manual.

WTE Reference	
This can be found at the top right hand side of the Delivery Note	
SITE	
Contact Name	
Address	
Post Code	
Contact Phone Number	
Contact Email	
INSTALLATION	
Date	
Company	
Name of Installer	
Company / Installer Address	
Phone Number	
COMMISSIONING	
Date	
Company	
Name of Engineer	
Company / Engineer Address	
Phone Number	
COMPONENTS	
Air Blower Serial Number	
Larger systems may have two air blowers.	
Air Blower Backpressure	
A reading, and photo of the reading, must be recorded for <u>every</u> air blower to validate blower warranty. A copy of the photo must accompany this form.	
Discharge Pump Serial Number (if fitted)	
Larger systems may have two pumps.	

Introduction

Vortex is a sewage treatment plant designed to process wastewater from buildings that do not have access to municipal wastewater infrastructure.

The Vortex system provides an ideal solution for domestic homes, offices, pubs, restaurants, campsites and other sites that require on site wastewater treatment.

Vortex is made from HDPE and is divided into three chambers with each chamber performing a different step in the treatment process.

1. Wastewater enters the Vibro Screen where any solids are physically broken down by coarse air bubbles.
2. The wastewater then flows into the aeration chamber where it is aerated by a fine bubble diffuser. The fine air bubbles provide excellent oxygen transfer into the wastewater slurry and enable a bacterial culture to develop. These aerobic bacteria then digest pollutants in the wastewater and clean it.
3. The cleaned wastewater then enters the Final Settlement Tank where settleable and floating solids are allowed to form a sludge at the bottom and top of the chamber. The clean effluent in the middle of the chamber is separated off and allowed to leave the tank. The sludge management system continually recycles the settled and floating sludge for further digestion.

Vortex is designed to treat wastewater that is domestic in nature. The influent must not contain trade waste. If you require advice, please contact our office.

Vortex is designed to treat wastewater only. The influent must not contain any roof water, surface water or groundwater.

WTE Ltd strongly recommends that Vortex tanks are installed by contractors who have been trained on the system's installation and operation.

Please contact our sales office for details of your nearest installer.

Health & Safety

Sewage poses a serious risk to health.

Pathogens in sewage and wastewater can lead to many diseases such as:

Campylobacteriosis	Hepatitis A	Shigellosis
Cryptosporidiosis	HIV	Paratyphoid Fever
Escherichia coli Diarrhoea	Leptospirosis	Typhoid Fever
Encephalitis	Methaemoglobinaemia	Yersiniosis
Gastroenteritis	Poliomyelitis	
Giardiasis	Salmonellosis	

Every precaution should be taken to ensure a safe working environment.

Receipt of Goods

Upon delivery all goods must be inspected for damage and to ensure that all components are present.

Every Vortex sewage treatment plant is supplied with the following:

- 1x Blower Housing
- 1x Air Blower (2x Air Blowers on 30PE model)
- 1x Solenoid Valve & Timer
- 1x Alarm Light

All of the above items are shipped in the Blower Housing which is placed inside the Vortex tank.

If the Vortex tank is damaged or any of the components are damaged or missing then this must be recorded on the P.O.D. (proof of delivery document) and WTE Ltd must be notified immediately.

If goods are damaged or items are missing but the P.O.D. has been signed for as undamaged and complete WTE Ltd will be unable to exchange the goods in question or supply additional items free of charge.

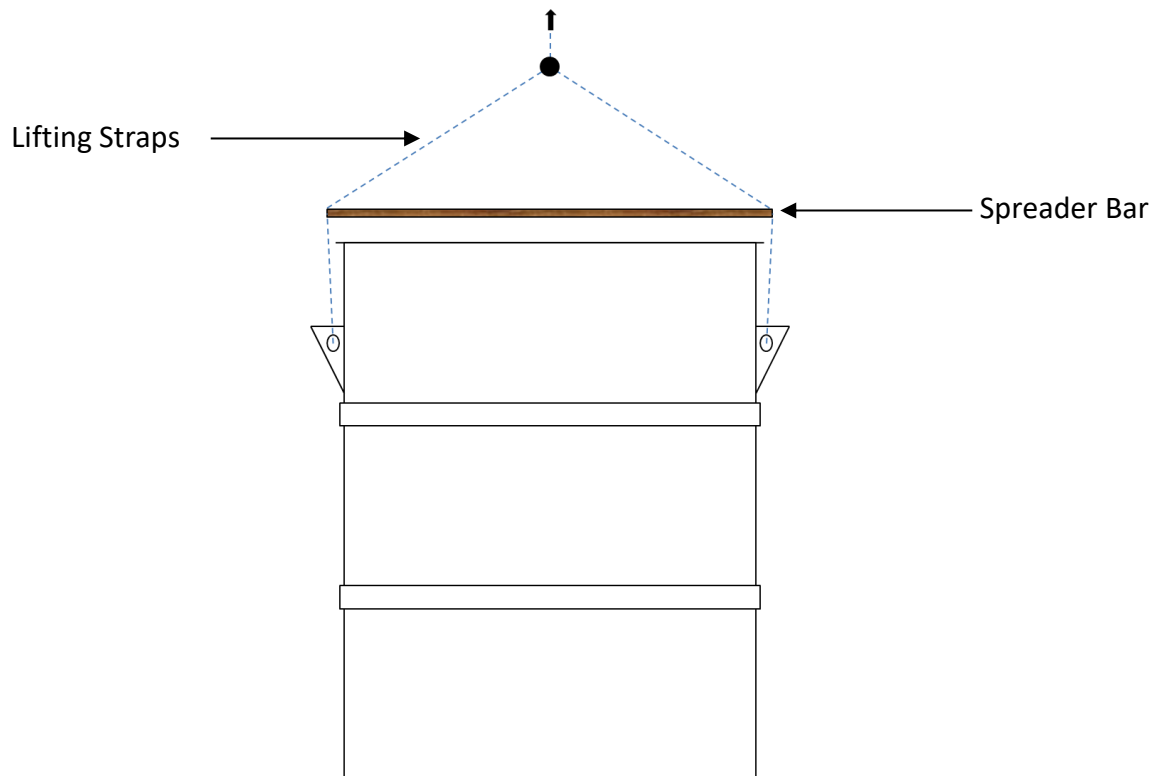
In most cases electrical components (air blower, solenoid valve, timer, etc.) are shipped in the blower housing which is placed inside the tank. If the tank is not going to be used immediately, the blower housing and all electrical components must be removed from the tank and stored in a dry place.

Handling & Storing

The tank should only be lifted if it is empty.

When lifting the tank both parts of the lid should be in place to prevent the tank distorting.

The tank should be lifted via a rated strap placed through the lifting lugs. A spreader bar must be used above the tank to prevent the lifting straps from pressing against the lid (see below).



The tanks should be stored vertically on a smooth and level surface. Wherever possible the tanks should not be stored on pallets.

In warm weather (>15°C) the tanks should be stored in a cool, shaded location if possible.

Installation - Below Ground

The method of installation is dependant of the site's ground conditions.

Sites are divided into one of three categories:

Dry Site Where ground water or the water table does not rise above the base of the excavation at any time of the year.

Wet Site Where ground water or the water table rises, or it suspected to rise, above the base of the excavation but not higher than 1,000mm from ground level.

Saturated Site Where ground water or the water table rises, or it suspected to rise, to within 1,000mm or less of ground level.

Do not undertake any concrete work if the temperature is likely to drop below freezing within the following 24 hours.

Ensure the area is secure before undertaking any works.

Dry Site Installation

Excavate a hole that is 200mm greater than the diameter of the tank.

The excavation should be sufficiently deep so that the tank inlet is at the same depth as the incoming drain from the building.

The tank must be placed a smooth, level and stable base. This base must be suitable for the site specific ground conditions and soil structure. It must also be suitable for the operating weight of the Vortex tank. The tank must be able to distribute its weight evenly across the whole base.

The base must be free of any sharp objects or other objects that may puncture the tank.

A 150mm reinforced C28/35 concrete base is often the preferred option for many sites

If the ground contains high levels of contaminants, including for example sulphate or chloride, this concrete mix will not be suitable. In these circumstances the advice of a qualified civil or structural engineer should be sought.

The tank should be safely lowered into the excavation using suitable rated straps.

Once the tank is in position the inlet and outlet pipes should be connected to the respective drainage pipes.

The void around the tank should be backfilled with soft sand. The sand should be free of stones and sharp objects. The backfilling should be done in 200mm layers and tamped by hand so ensure that there are no voids.

Do not pour backfill material directly onto the tank.

During backfilling the lid should be closed to prevent the backfill material from being poured in to the Vortex plant. This is also required to ensure that the tank retains its shape.

During backfilling the tank should be filled with clean water. The water level inside the tank should lead the backfill by 200mm.

Prior to filling the tank with water, the rigid vertical air pipe (in larger systems there is more than one) in the Biozone that supplies air to the fine bubble diffuser, must be pushed down to ensure it is correctly seated in the bracket at the base of the tank. This is to ensure that the diffuser is captive and cannot move post installation.

The last 200-300mm of backfilling should be done with top soil. The top soil must be loose and free from stones, clay and sharp objects. The top soil should be laid and tamped in the same way as the sand.

Finished ground level should be 50mm below the tank lid. This is to prevent the ingress of surface water into the tank.

Ensure a duct is laid from the 110mm connection on the tank to Blower Housing. The duct is for:

1. The air hose that connects the air blower to the rigid air pipe inside that tank.
2. The air hose from the solenoid valve to Settled Sludge Return (SSR) pipe.

Once the above hoses have been pulled through the duct and connected, the duct must be sealed at both ends with expanding foam. This is vital as the air blower(s) must not be allowed to draw air from inside the tank. If they do, the warranty on the air blower will be voided.

Wet Site Installation

If required the site should be dewatered prior to, during and after the installation of the Vortex tank via the use of a side sump or other appropriate dewatering method. During dewatering it is essential that cement and other constituents are not drawn out of the concrete by the action of the dewatering pumps.

Depending on site conditions the excavation may require shuttering to prevent it from collapsing.

Independent engineering advice should be sought if there is any doubt regarding these issues.

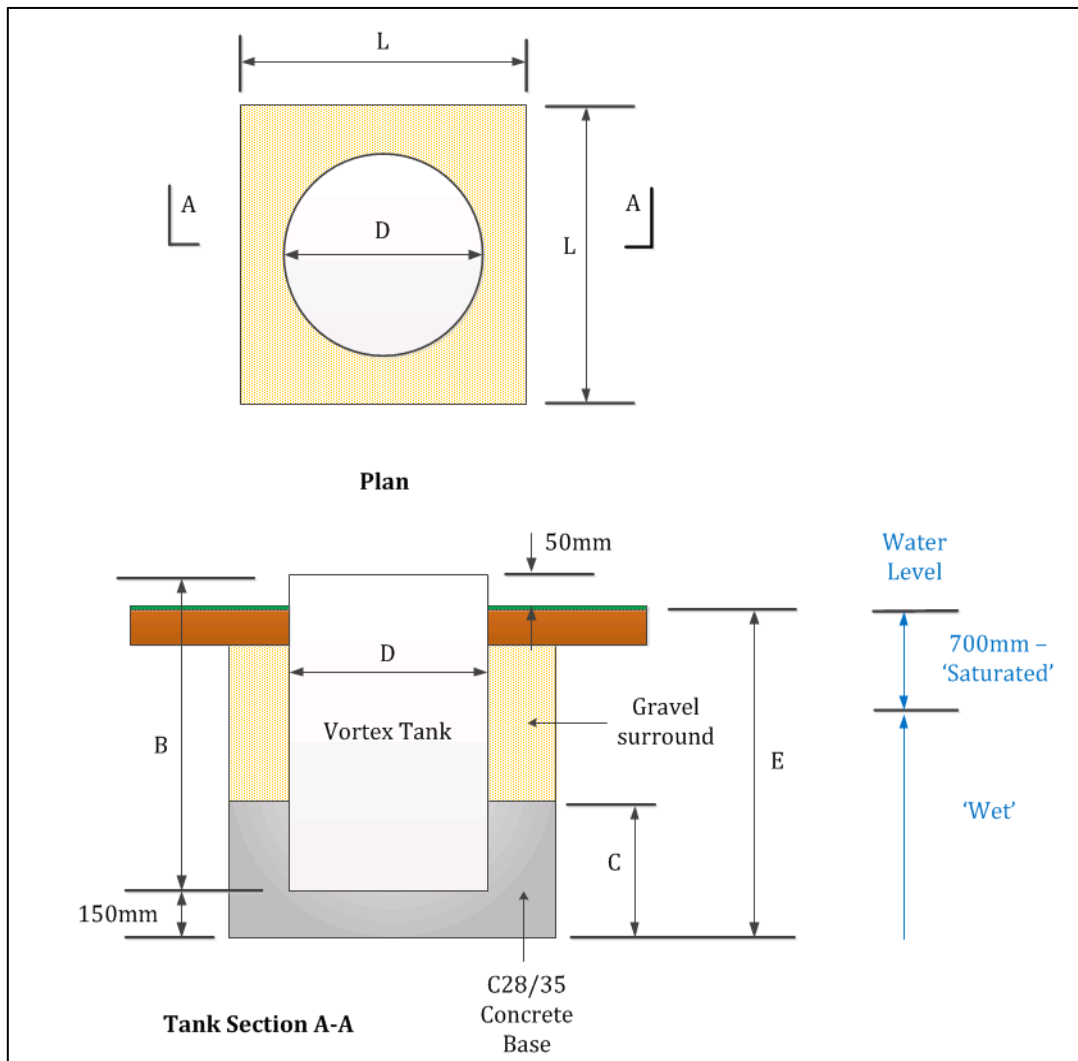


Table A

Model	Tank			Excavation		Concrete
	Inlet Invert (mm)	Diameter (D) (m)	In Ground Depth (B) (m)	Depth (E) (m)	Length & Width (L) (m)	Backfill (C) (m)
Vortex 4	200	1.121	1.650	1.800	1.600	1.500
	550	1.121	2.000	2.150	1.600	1.500

	950	1.121	2.400	2.550	1.700	1.500
Vortex 6	200	1.230	1.650	1.800	1.690	1.500
	550	1.230	2.000	2.150	1.690	1.500
	950	1.230	2.400	2.550	1.790	1.500
Vortex 9	200	1.500	1.650	1.800	1.940	1.500
	550	1.500	2.000	2.150	2.240	1.500
	950	1.500	2.400	2.550	2.240	1.500
Vortex 12	200	1.730	1.650	1.800	2.270	1.500
	550	1.730	2.000	2.150	2.470	1.500
	950	1.730	2.400	2.550	2.570	1.500
Vortex 16	350	1.770	2.250	2.400	2.610	2.000
	750	1.770	2.650	2.800	2.700	2.000
Vortex 21	350	1.770	2.250	2.400	2.610	2.000
	750	1.770	2.650	2.800	2.700	2.000
Vortex 30	350	2.100	2.250	2.400	3.100	2.000
	750	2.100	2.650	2.800	3.100	2.000

Excavate a square excavation to the dimension 'L' and depth 'E' given in Table A.

Ensure that the excavation sides are properly and fully supported throughout the works, with all water being pumped away to ensure that the excavation is kept dry.

Place concrete onto dry formation to a depth of 150mm using a semi-dry C28/35 mix to BS EN 206-1 / BS 8500. (Max aggregate Size: 40mm, Consistence class: S1)

If the ground contains high levels of contaminants, including for example sulphate or chloride, this concrete mix will not be suitable. In these circumstances the advice of a qualified civil or structural engineer should be sought.

Compact and finish with a tamped and level surface.

Place the tank onto the concrete formation.

Ensure the tank is level and connect the outlet and inlet pipes as necessary.

Fill the tank with 300mm of clean water.

Ensure the tank is secure and surround the tank to the depth 'C' given in Table A with a semi-dry C28/35 mix to BS EN 206-1 / BS 8500. (Max aggregate Size: 40mm, Consistence class: S1). Ensure filling is brought up on each side of the tank in a uniform and even manner.

Do not pour backfill material directly onto the tank.

The concrete surround should be poured in 200mm layers with each layer being tamped by hand to eliminate voids. A vibrating poker must not be used.

The tank must continue to be filled with clean water during backfilling of the excavation. The water inside the tank should lead the backfill by 300mm.

Prior to filling the tank with water, the rigid vertical air pipe (in larger systems there is more than one) in the Biozone that supplies air to the fine bubble diffuser, must be pushed down to ensure it is correctly seated in the bracket at the base of the tank. This is to ensure that the diffuser is captive and cannot move post installation.

During backfilling the lid should be closed to prevent the backfill material from being poured in to the Vortex plant. This is also required to ensure that the tank retains its shape.

Finish with a hand tamped level surface.

Ensure excavation is kept free from water for at least 3 days (may reduce to 1 day in very warm weather). This is to allow the concrete to set.

The water in the tank must remain in place until the concrete has fully cured.

Once the concrete has set the excavation should be backfilled with gravel. Filling is to be undertaken uniformly on each side to prevent uneven loading on the tank.

The last 300mm should be backfilled with topsoil.

Backfilling must terminate 50mm below the lid of the tank.

Ensure a duct is laid from the 110mm connection on the tank to Blower Housing. The duct is for:

1. The air hose that connects the air blower to the rigid air pipe inside that tank.
2. The air hose from the solenoid valve to Settled Sludge Return (SSR) pipe.

Once the above elements have been pulled through the duct and connected, the duct must be sealed at both ends with expanding foam. This is vital as the air blower(s) must not be allowed to draw air from inside the tank. If they do, the warranty on the air blower will be voided.

Saturated Site Installation

If required the site should be dewatered prior to, during and after the installation of the Vortex tank via the use of a side sump or other appropriate dewatering method. During dewatering it is essential that cement and other constituents are not drawn out of the concrete by the action of the dewatering pumps.

Depending on site conditions the excavation may require shuttering to prevent it from collapsing.

Independent engineering advice should be sought if there is any doubt regarding these issues.

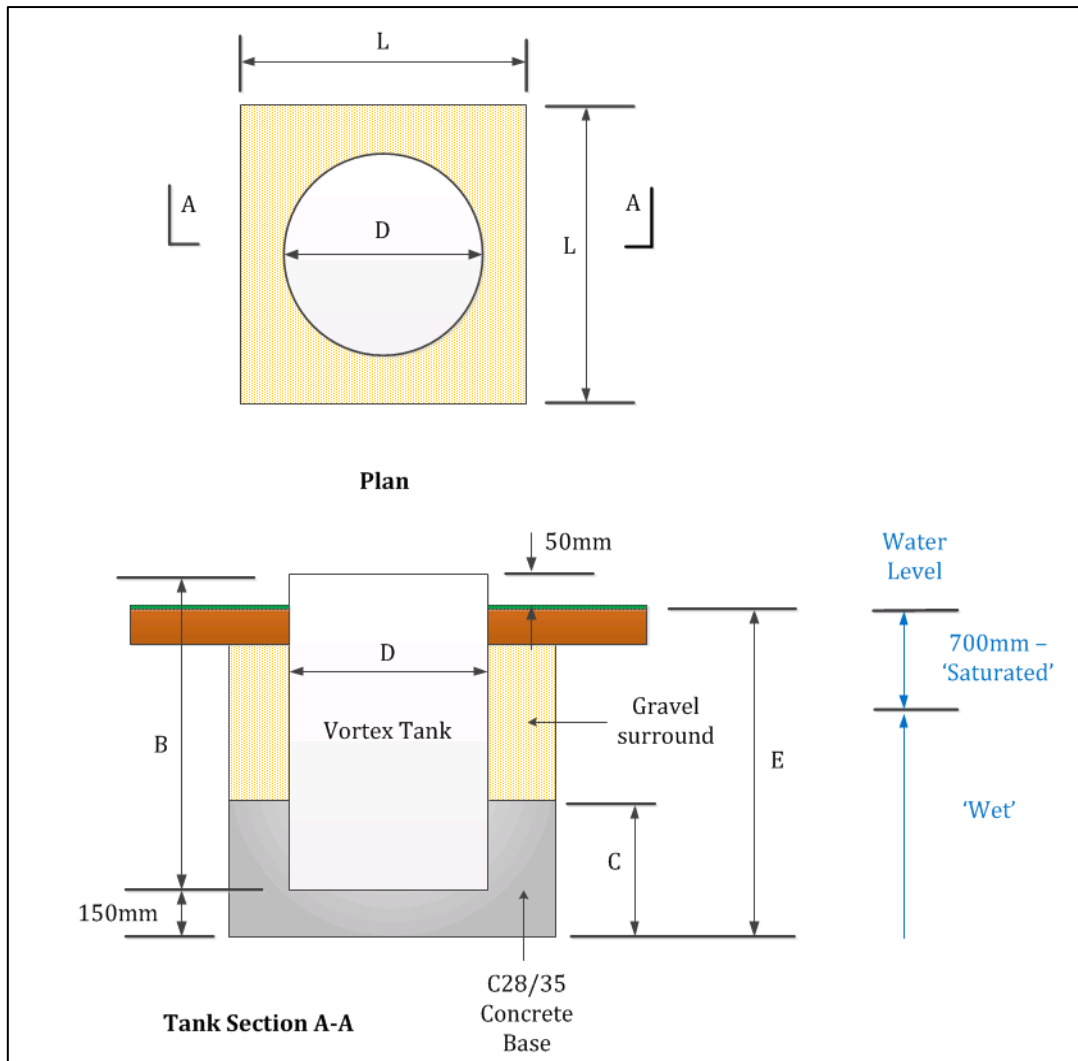


Table B

Model	Tank			Excavation		Concrete
	Inlet Invert (mm)	Diameter (D) (m)	In Ground Depth (B) (m)	Depth (E) (m)	Length & Width (L) (m)	Backfill (C) (m)
Vortex 4	200	1.121	1.650	1.800	1.800	1.600
	550	1.121	2.000	2.150	1.900	1.800
	950	1.121	2.400	2.550	1.900	2.300
Vortex 6	200	1.230	1.650	1.800	1.800	1.600
	550	1.230	2.000	2.150	1.900	1.800
	950	1.230	2.400	2.550	1.900	2.300
Vortex 9	200	1.500	1.650	1.800	2.250	1.600
	550	1.500	2.000	2.150	2.250	1.900
	950	1.500	2.400	2.550	2.250	2.300
Vortex 12	200	1.730	1.650	1.800	2.450	1.600
	550	1.730	2.000	2.150	2.550	1.900
	950	1.730	2.400	2.550	2.550	2.300

Vortex 16	350	1.770	2.250	2.400	2.600	2.200
	750	1.770	2.650	2.800	2.600	2.600
Vortex 21	350	1.770	2.250	2.400	2.600	2.200
	750	1.770	2.650	2.800	2.600	2.600
Vortex 30	350	2.100	2.250	2.400	3.050	2.200
	750	2.100	2.650	2.800	3.050	2.600

Excavate a square excavation to the dimension 'L' and depth 'E' given in Table B.

Ensure that the excavation sides are properly and fully supported throughout the works, with all water being pumped away to ensure that the excavation is kept dry.

Place concrete onto dry formation to a depth of 150mm using a semi-dry C28/35 mix to BS EN 206-1 / BS 8500. (Max aggregate Size: 40mm, Consistence class: S1)

If the ground contains high levels of contaminants, including for example sulphate or chloride, this concrete mix will not be suitable. In these circumstances the advice of a qualified civil or structural engineer should be sought.

Compact and finish with a tamped and level surface.

Place the tank onto the concrete formation.

Ensure the tank is level and connect the outlet and inlet pipes as necessary.

Fill the tank with 300mm of clean water.

Ensure the tank is secure and surround the tank to the depth 'C' given in Table B with a semi-dry C28/35 mix to BS EN 206-1 / BS 8500. (Max aggregate Size: 40mm, Consistence class: S1). Ensure filling is brought up on each side of the tank in a uniform and even manner.

Do not pour backfill material directly onto the tank.

The concrete surround should be poured in 200mm layers with each layer being tamped by hand to eliminate voids. A vibrating poker must not be used.

The tank must continue to be filled with clean water during backfill of the excavation. The water inside the tank should lead the backfilling by 300mm.

Prior to filling the tank with water, the rigid vertical air pipe (in larger systems there is more than one) in the Biozone that supplies air to the fine bubble diffuser, must be pushed down to ensure it is correctly seated in the bracket at the base of the tank. This is to ensure that the diffuser is captive and cannot move post installation.

During backfilling the lid should be closed to prevent the backfill material from being poured in to the Vortex plant. This is also required to ensure that the tank retains its shape.

Finish with a hand tamped level surface.

Ensure excavation is kept free from water for at least 3 days (may reduce to 1 day in very warm weather). This is to allow the concrete to set.

The water in the tank must remain in place until the concrete has fully cured.

The remaining excavation should be backfilled with topsoil.

Backfilling must terminate 50mm below the lid of the tank.

Ensure a duct is laid from the 110mm connection on the tank to Blower Housing. The duct is for:

1. The air hose that connects the air blower to the rigid air pipe inside that tank.
2. The air hose from the solenoid valve to Settled Sludge Return (SSR) pipe.

Once the above elements have been pulled through the duct and connected, the duct must be sealed at both ends with expanding foam. This is vital as the air blower(s) must not be allowed to draw air from inside the tank. If they do, the warranty on the air blower will be voided.

Installation – Above Ground

The tank must be placed a smooth, level and stable base. This base must be suitable for the site specific ground conditions and soil structure. It must also be suitable for the operating weight of the Vortex tank.

The tank must be able to distribute its weight evenly across the whole base.

The base must be free of any sharp objects or other objects that may puncture the tank.

A 200-300mm reinforced concrete base is often the preferred option on many sites

For sites where the winter temperature may drop below 0°C the Vortex must be insulated against the cold.

A possible method of insulating the Vortex is to construct a solid wall, 50mm shorter than height of the tank, around the Vortex unit. There should be a gap of at least 300mm between the tank and the wall and the gap can be filled with compacted sand or other insulative material.

Blower Housing

Tanks are supplied with the Blower Housing as a separate item.

The Blower Housing sits above ground adjacent to the tank.



The Blower Housing should be positioned as close to the tank as possible and no further than 5m away (3m of airline is provided).

The Blower Housing is connected to the tank via a 110mm duct (not supplied).

Every effort should be taken to ensure the duct connects the Blower Housing to the tank in a straight line. Where bends are necessary, they must be sweeping (long radius) bends.

There are two airlines inside the tank that need to be connected to fittings inside the Blower Housing through the 110mm duct.

As shown below, the green airline is connected to the T fitting on the solenoid valve and the white airline is connected to the elbow.

Any excess airline must be cut off.



Both ends of the duct must be sealed with expanding foam to prevent the air blower(s) drawing air from inside the tank.

The Blower Housing should be orientated so that the alarm light will be seen when it activates.

Electrical Installation

All electrical work must be carried out by qualified personnel, using suitable materials and must comply with current regulations.

All electrical items must be sited and installed so that wherever possible a service engineer has full access to the system without requiring entry to a building.

The electrical contractor must provide a steel wire armoured (SWA) cable from a local fused point of isolation to the socket in the Blower Housing.

Cable protection should be provided via 6 amp miniature circuit breaker (MCB) protected by residual current detector (RCD), rated 230V, AC and tripping current 0.03 amps.

The incoming electric cable should come through the base of the Blower Housing to the left of the power socket.

A suitable waterproof gland must be used to bring the cable into the Blower Housing. A drill start is moulded into the underside of the base to give the exact location for cable entry.

The equipment in the Blower Housing is pre-assembled. The power supply cable should be connected into the socket provided.

Setting the Timer

The timer that operates the solenoid valve must be set so that it energises the solenoid as follows:

ON (Valve Open)	OFF (Valve Closed)
5 mins	60 mins



The solenoid valve will then open for five minutes and then close for one hour where upon the cycle is repeated.

Air Blower Backpressure

Once all air line connections have been made and power supplied to the blower housing, the backpressure in the air line must be checked.

A pressure gauge must be fitted to the air line immediately after the air blower. For tanks with more than one air blower, a backpressure reading must be taken and recorded for every air blower.

The backpressure should be around 150mbar and must not exceed 200mbar.

If the backpressure exceeds 200mbar the air line must be checked for obstructions or shortened until the backpressure is below 200mbar and ideally under 180mbar.

The final backpressure reading(s) must be noted on the **Installation Record Sheet** and the completed sheet returned to our office.

A photo of each reading must be taken and emailed to sales@wte-ltd.co.uk. The email subject/title must include the invoice number for the tank. The invoice number can be found on the top right hand side of the delivery note attached to the tank.

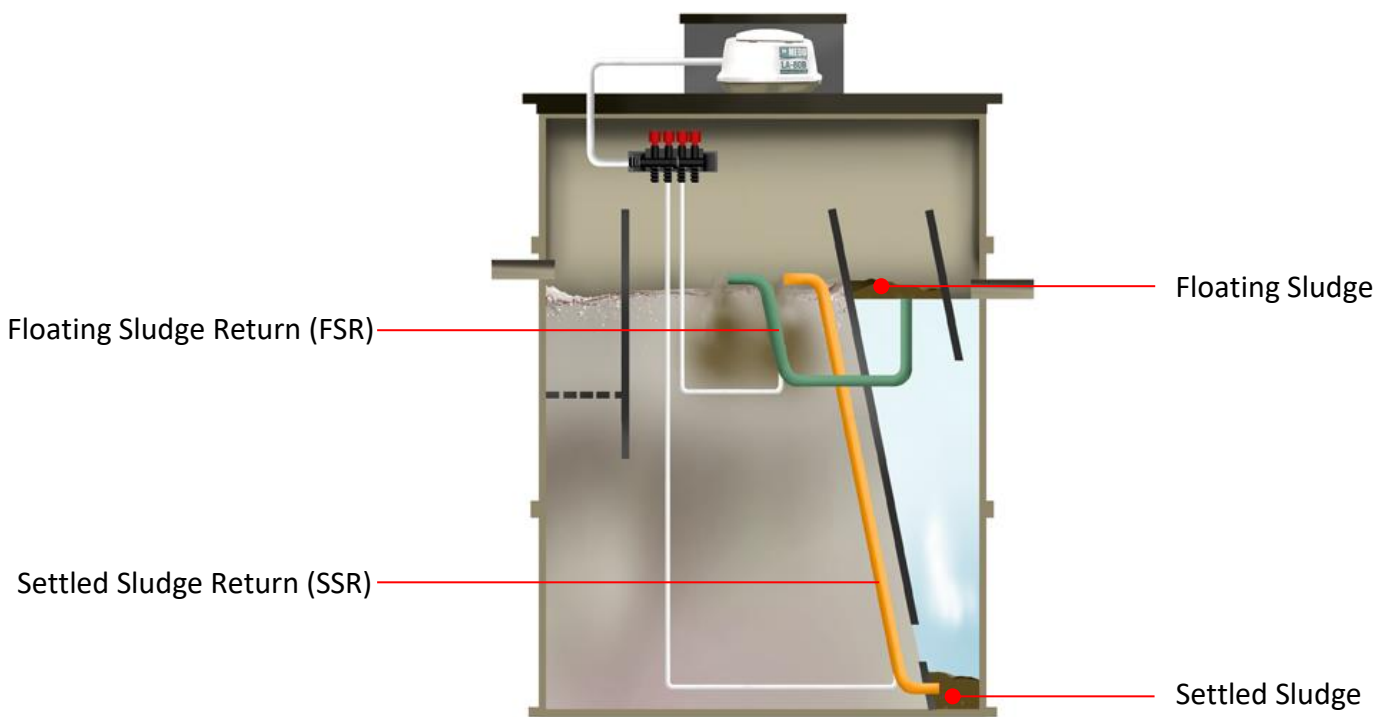
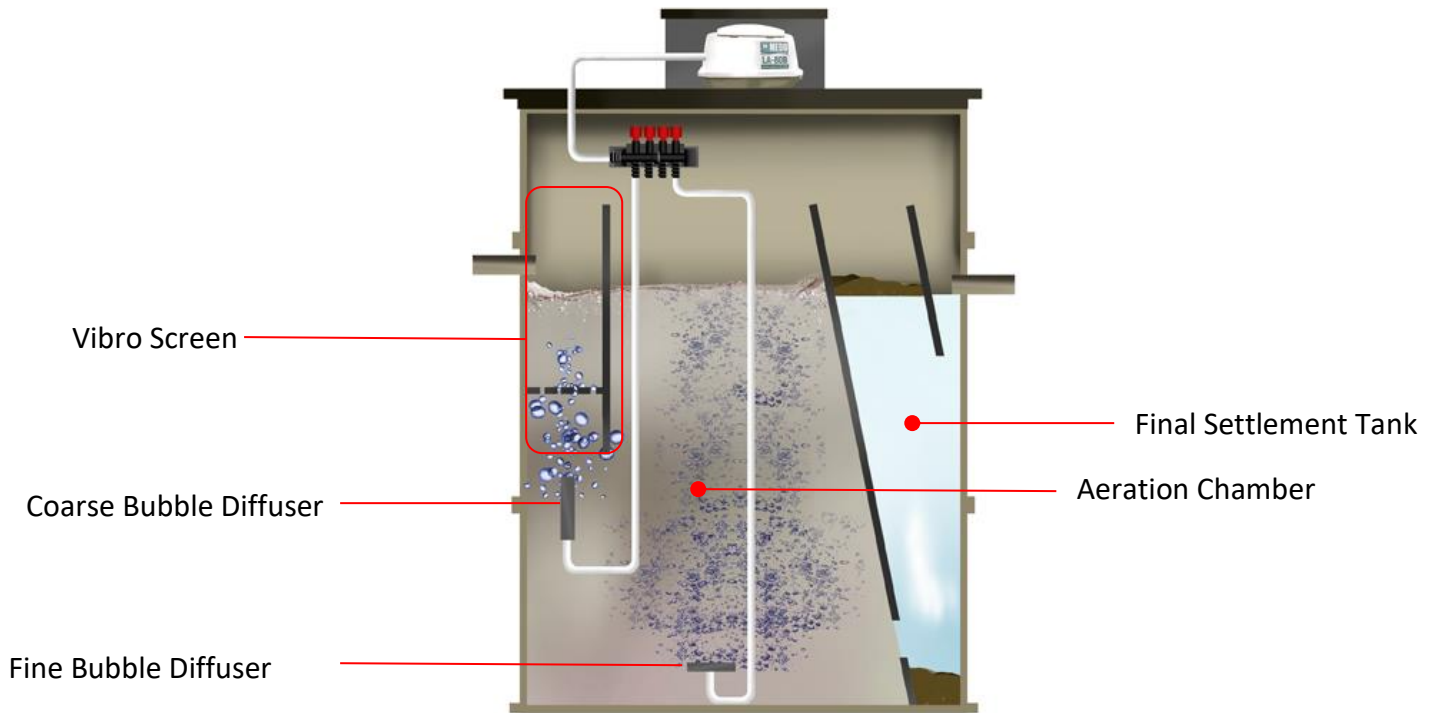
If the installation record sheet and photo are not returned to us the blower warranty will not be valid.

If the backpressure is checked using an analogue gauge, the gauge must not exceed 600mbar. If it does, then it will not be sufficiently accurate for a reading to be taken.

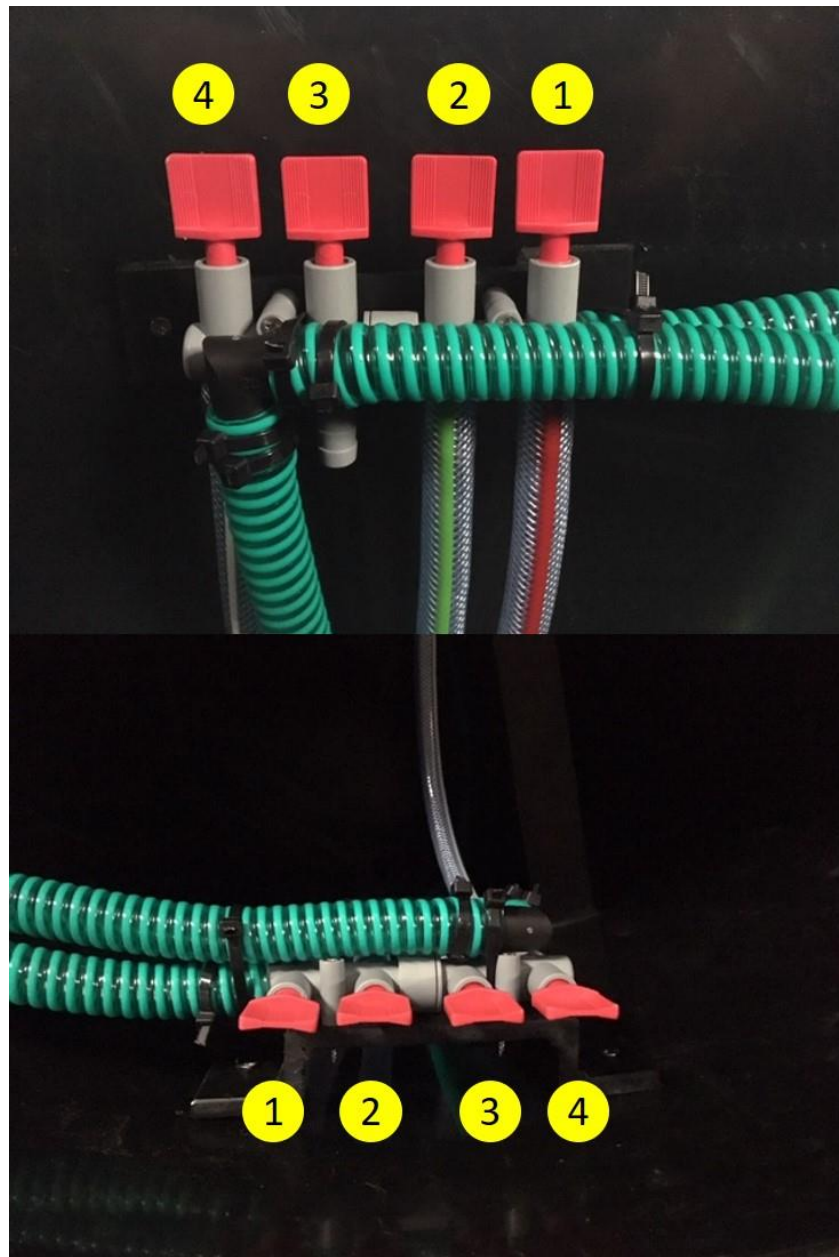
Digital gauges must be accurate to +/-1% or better.

Digital and analogue gauges can be purchased from our sales office.

Sludge Management System (SMS)



Old Type Regulator



The Air Regulator must be set so that the correct volume of air is supplied to all four components inside the Vortex sewage treatment plant:

1. Course Bubble Diffuser (Vibro Screen).
2. Settled Sludge Return (SSR)
3. Redundant. This valve must be fully closed.
4. Fine Bubble Diffuser. This is redundant on 16, 21 and 30PE models as air to the fine bubble diffusers is spurred from the green hose.

New Type Regulator



The Air Regulator must be set so that the correct volume of air is supplied to the components inside the Vortex sewage treatment plant:

- **Black Valve** Fine Bubble Diffuser(s) (Biozone)
- **Green Valve** Settled Sludge Return (SSR)
- **Purple Valve** Coarse Bubble Diffuser (Vibro Screen)

The majority of air must be supplied to the fine bubble diffuser.

The coarse bubble diffuser in the Vibro Screen should continuously blow air into the chamber to physically breakdown solids entering the tank. The aeration in the Vibro Screen should resemble vigorously boiling water.

Air should be supplied to the SSR so that it continuously recycles water and sludge from the base of the Final Settlement Tank back to the Biozone.

A video showing what the aeration in the Vortex should look like can be seen here:

<http://www.youtube.com/watch?v=SdFbJMEjWrw>

It is essential that the Air Regulator is set correctly as the system may fail to function correctly if it is not. WTE Ltd recommends that Vortex tanks are installed and commissioned by trained personnel.

The backpressure in the airline should be checked using a pressure gauge whilst the air blower(s) is running. The backpressure should be 150mbar (0.15bar). If the backpressure is greater than 150mbar then valves on the regulator should be opened to reduce the restriction to air flow.

In order to validate any future warranty claim on the air blower(s), a record of the backpressure at the time of installation will be required. Please record the backpressure on the installation record sheet at the front of this manual and inform the owner that the sheet must be retained.

Ventilation

All Sewage Treatment Plants will produce methane and other gasses that **must** be vented out of the tank.

In the case of Sewage Treatment Plants where air is blown into the system there must be sufficient ventilation to allow this air to be expelled from the lid of the tank.

The most common method of ventilation is to utilise the soil vent stack on the outside of the building. This provides an open duct for air, methane and other gasses to be expelled from the tank.

Alternatively, a 110mm vent can be spurred off either the inlet or the outlet pipe (gravity outlet tanks only).

Pumped Outlet

If a pumped outlet is required WTE Ltd can provide a separate Effluent Pump Station.

To order an Effluent Pump Station please contact our office on **+44 (0) 1759 369 915**.

Commissioning

Providing the installation procedure above has been done correctly there is no need for commissioning.

It is not unusual for untrained contractors to make mistakes during the installation process, particularly when setting the Air Regulator. For this reason we strongly recommend that once the tank has been installed it is commissioned by a trained installer or service engineer to ensure that it is ready for use.

Please contact our office on **+44 (0) 01759 369 915** for details of your nearest trained contractor.

We are always looking to expand our network of trained contractors. If you are interested in becoming a WTE approved installer/service engineer please contact our office on the numbers above.