

Installation Manual - Vortex

Introduction

The Vortex sewage treatment plant is designed to process wastewater for 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.

The Vortex tank 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 clarification chamber 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.

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

Please contact our sales office on **+44 (0) 1757 289 423** for details of your nearest installer.

Assessment

Site assessment is required to obtain sufficient information to determine if the site is suitable for a Sewage Treatment Plant and/or drainage field.

Pre Installation Checks

- Is the site in a groundwater protection zone? This may prohibit a drainage field on the site. WTE Ltd or the Environment Agency can provide this information.
- Depth of winter groundwater table. The depth of the groundwater table at its highest point during the year is important for both the installation and drainage field if applicable. This must be assessed prior to installation.
- Percolation tests must be performed to BS6297:2007 and Section H2 of Building Regulations prior to the installation of a drainage field

Locating the Sewage Treatment Plant

The table below outlines the distance that Sewage Treatment Plants should be from various features. This is intended as guidance and clarification should be sought from Building Control.

Please note that all Sewage Treatment Plants require servicing and aquatic Sewage Treatment Plants require regular desludging by a tanker and should be located no further than 30m from a vehicle access point

Sewage Treatment Plants & Septic Tanks

Feature	Distance (m)
Habitable Building	7
Watercourse	10
Well / Borehole / Spring	50
Site Boundary	2
Road	4

Drainage Fields & Drainage Mounds

Feature	Distance (m)	
	Building Regulations	BS 6297:2007
Habitable Building	15	7
Watercourse	10	10
Well / Borehole / Spring	50*	-
Site Boundary	-	2

Sewage Treatment Plants are designed for pedestrian traffic only. Adequate protection should be given to avoid super- imposed loads. Vehicles must be restricted from the region surrounding the Plant.

Vehicles should maintain a distance equal to the depth of the excavation unless the necessary structural protection around the tank has been provided.

Suitable fencing to prevent access by children and animals should also be erected.

* This is the recommendation of the Environment Agency however WTE Ltd recommends that it be situated at least 200m from a well, borehole or spring as we have known boreholes be rendered unusable with drainage fields located 150m away.

Receipt of Goods

Upon delivery all goods must be inspected for damage and to ensure that all components are present. WTE Ltd must be notified immediately if any damage is seen or suspected or if any components are missing. If the goods damaged or items are missing but the delivery 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.

Prior to the installation the Transport Screw that prevents the diffuser from moving during transportation of the tank must be removed. This is to enable the diffuser to be removed for maintenance post installation.

Handling & Storing

The tank should be lifted via a rated strap placed through the inlet and outlet.

The tank should not be lifted if it contains water / wastewater.

The tanks should be stored on a pallet or similar object to prevent the base being punctured by objects on the ground.

Installation - Below Ground

The information below is for guidance only.

It is the responsibility of the installer to ensure that the installation method and materials are suitable for the specific site conditions at all times of the year.

Dry Site Installation

A dry site is one where the groundwater table does not rise higher than the deepest part of the excavation at any point of the year.

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.

The tank should be safely lowered into the excavation using suitable rated straps placed through the inlet and outlet. The tank must not be lifted if it contains water.

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 in the sand backfill.

During backfilling the lid should be closed to prevent the backfill material from being poured in to the Vortex plant.

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

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.

A rubber seal must be used on the tank inlet between the tank wall and incoming 110mm drain pipe. The seal is provided in the Vibro Chamber.

Wet Site Installation

A wet site is one where the water table is known to or suspected of rising above the base of the excavation at any time of the year.

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.

For wet sites it is recommended that the excavation be extended by at least 250mm and a level hardcore base be laid and compacted. Safe working practises must be implemented.

Reinforced concrete should be laid in the base of the excavation to a minimum depth of 200mm. The concrete should be of a suitable strength and slump for the specific site conditions and must take into account the load imposed by the operating weight of the Vortex sewage treatment plant. It must be noted that the Vortex may require desludging at any time of year and will therefore be empty; the installation method and materials must allow for this. It is recommended that a minimum concrete strength of C25 be used.

Once a concrete base has been laid the tank should be safely lowered into the hole as per the Dry Site instructions.

Concrete of a suitable slump and strength should be used to backfill the excavation. The concrete surround should be a minimum thickness of 200mm around the tank and be poured in 200mm layers. It should be tamped by hand to eliminate voids. A vibrating poker must not be used.

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

If required the site must be continued to be dewatered until the concrete has fully cured.

The Vortex must remain full of water until the concrete backfill has fully cured.

The concrete backfill should extend up to the underside of the outlet pipe.

Above the outlet pipe the backfill procedure is the same as a Dry Site.

Installation – Above Ground

NB: if a Vortex is to be installed aboveground then it must be a specially constructed Vortex AG tank.

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.

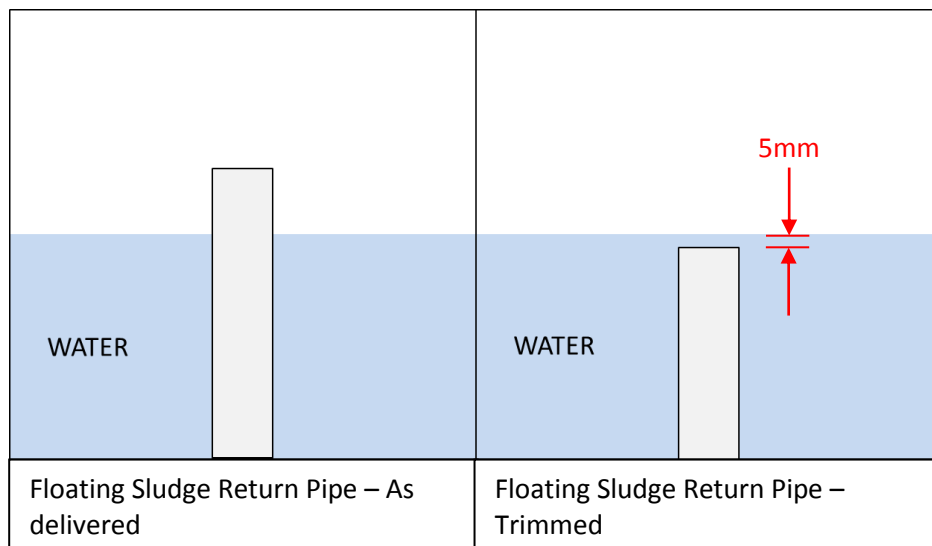
The base must be free of any sharp objects or other objects that may puncture the tank.

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.

Sludge Management System (SMS)

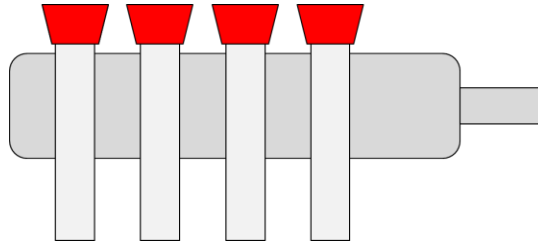
The floating sludge return pipe must be trimmed so that it is able to skim the surface of the water in the clarification chamber. This can only be done once the tank is full of water. Please see the pictures below.



The floating sludge return pipe must be trimmed so that the top of the pipe sits 5mm below the waterline in the clarification chamber.

Once the floating sludge return pipe has been trimmed the sludge management system must be set.

Air from the blower is supplied to the air regulator inside the Vortex tank. See picture below.



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 – the coarse bubble diffuser, the fine bubble diffuser, the settled sludge air lift and the floating sludge air lift.

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.

Air should be supplied to the air lift pipes so that they are constantly recycling from the top and bottom of the clarification chamber back to the aeration chamber.

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.

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 Vortex is supplied with a waterproof socket in the blower housing .

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.

The cable should enter the body of the Vortex tank and then pass up through the lid of the tank into the blower housing. Waterproof fittings must be used where the cable passes through the body of the tank and where it passes through the lid of the tank into the blower housing.

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

Once commissioned never disconnect the power to the air blower.

Ventilation

All Sewage Treatment Plants and Septic Tanks 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 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 Sewage Treatment Plant or Septic Tank

If ventilation is not adequate then the gasses produced will escape from the foul drainage system by the easiest possible means. This is usually through the lid of the tank. This is generally undesirable as the escaping gasses may be offensive.

To ensure adequate ventilation the following guidelines should be adhered to.

- Ensure that a soil vent pipe is fitted to the foul drainage at the nearest point on the building to the Sewage Treatment Plant or Septic Tank. In some case multiple soil vent stacks may be required on a building.
- Air outlet vents must always slope upwards. No horizontal runs should be installed.
- Ensure that all foul drainage is in as straight a run as possible keeping bends to a minimum. No 90° bends should be fitted.
- The diameter of the air outlet vent must be at least the same diameter as the air inlet or foul drainage pipework.
- To reduce pipe resistance the Sewage Treatment Plant or Septic Tank should be fitted as close to the building as possible. Always adhere to Building Control regulations.
- No air admittance valves or other restrictions to air flow should be fitted to the air outlet vent.
- Ensure that air outlet vents are fitted with vent or balloon cowls to prevent birds nesting in them.
- Ensure that the top of the air outlet vent is not in a sheltered location or obstructed by foliage etc. Wind must be able to blow freely over the top of the air outlet vent.
- Ensure that vent pipes are not located below or in the vicinity of windows, air admittance vents or other structures.
- If passive ventilation is not possible then a wind driven or solar ventilator may be fitted to the top of the air outlet vent.

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) 1757 289 423**.

Effluent Disposal

This will require either a Permit or Permit Exemption from the Environment Agency, Environment Agency Wales, NI Environment Agency or SEPA.

The effluent from a Sewage Treatment Plant may be discharged in one of three ways:

- Direct to a watercourse. The watercourse must run 12 months of the year and provide a dilution ratio of 8:1 (water: effluent).
- Below ground drainage field. This must be designed, located and constructed to BS6297:2007 and Section H2 of Building Regulations.
- Above ground drainage field. This is a specialist structure. Please contact WTE Ltd.

The best disposal method can depend on a variety of site factors including percolation results, soil type, water table level and topography of the site.

Please contact WTE Ltd if you have any queries regarding the disposal of effluent as illegal discharges may result in prosecution.

Commissioning

Once the tank has been installed commissioning is available via either **White Rose Installations (+44 (0) 1757 289 555)** or **Sapphire Environmental (+44 (0) 1757 289 681)** prior to the tank going into use.