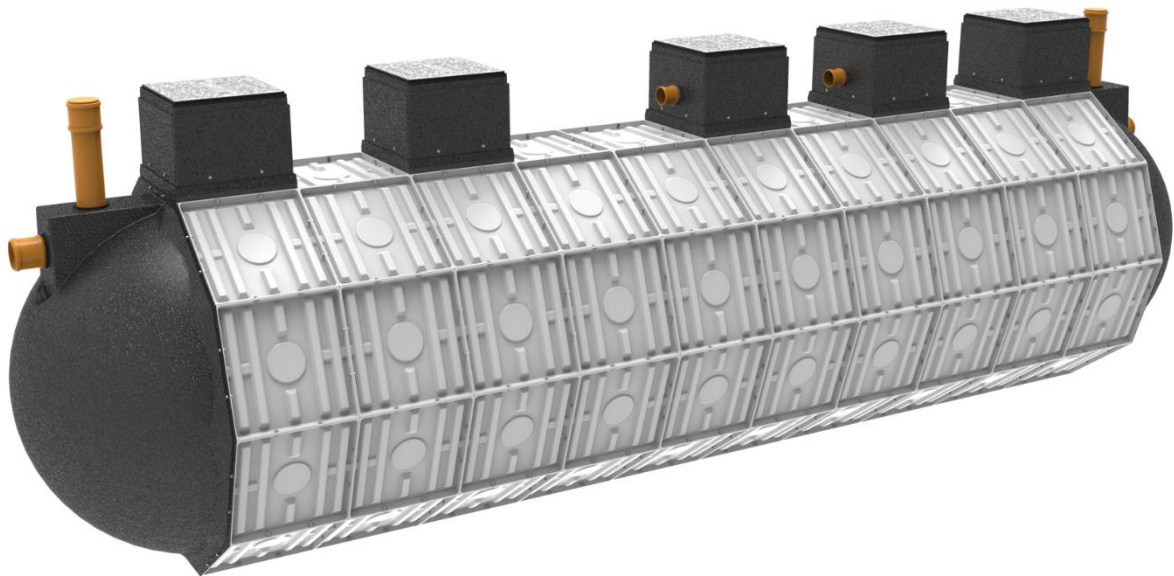


Harlequin®

MANUFACTURING FOR TOMORROW

COMMERCIAL SEWAGE TANK INSTALLATION AND OPERATING INSTRUCTIONS



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General Information

Introduction

It is strongly recommended that you read all sections of this manual before installing and operating your new Harlequin Commercial Sewage Tank. Some installation and operation requirements are specific to commercial tank products, and it is important to familiarise yourself with these.

This information is supplied as a best practise guide and it is the responsibility of the user/installer to verify that it is used appropriately for the ground and load conditions.

Installation of the equipment should only be undertaken by a qualified specialist who is covered with professional indemnity insurance.

End-user responsibilities

It is the end-user's responsibility to ensure that their drainage and sewage treatment system complies with statutory requirements and does not cause pollution to the environment. Guidance can be found at Planning & Building Control departments as well as environmental agency offices regarding statutory obligations.

A professional consultant (architect/consulting/Engineer/drainage consultant) with experience in off-mains systems should be appointed to carry out a detailed site assessment evaluation and design of the groundworks. In addition, the following requirements must be met:

- ***The plant must be installed, operated and maintained in accordance with the requirements of this document***

The Harlequin Commercial Sewage Tank is designed to provide full treatment of normal domestic wastewater to discharge direct to surface waters, removing the need for a drainage field (subject to a "Consent to discharge" license). In all cases, approval should initially be sought through the local authority Building Regulator. It may also be necessary to obtain the consent of:

The Discharge Permit (obtained from the relevant national Environment Agency) must be obtained before installation.

- The Environment Agency (EA - England and Wales)
- The Scottish Environment Protection Agency (SEPA - Scotland)
- Environmental Protection Agency (EPA - Ireland)
- The Northern Ireland Environment Agency (NIEA)

Health and Safety

The advice given in this document is provided with your safety in mind. This document should be retained for future reference and remain in the custody of the person/agency taking ownership of the system. The following health and safety guidelines should always be strictly adhered to in relation to the operation and maintenance of any wastewater treatment plant. It is important that:

- ***All electrical work is carried out by a qualified electrician***
- ***All plumbing work is carried out by a qualified plumber or groundworks engineer***
- ***All maintenance activities include appropriate measures to safely isolate electrical and water sources.***

At all times, safe working practices should be observed and adopted to avoid accident and injury when working with the equipment.

- The site should preferably be fenced off to prevent unauthorised access, particularly for small children
- The air blower housing/kiosks should be kept closed at all times when in operation
- The manhole covers should never be removed and left unattended, even during service visits
- The air blower housing/kiosks contains electrics operating at 240v. All equipment must be isolated before any maintenance is carried out
- Misuse can lead to serious injury and damage to the plant
- Protective clothing and gloves should be worn at all times and careful attention paid to personal hygiene, especially if there is any potential contamination with sewage products
- Medical attention must be sought if a user is feeling unwell after coming into contact with wastewater products

Leaving the tank unattended during servicing should be strictly discouraged in accordance with the health and safety procedures.

Warning: Wastewater treatment processes can produce hazardous gas concentrations even when vessels are fully drained. Never enter vessels without appropriate training and protective equipment.

Maintenance

It is important to note that it is the end user's responsibility to ensure that maintenance is performed on the system at the appropriate period. Maintenance will ensure good operation and avoid breakdown which could lead to environmental pollution. Environmental enforcement agencies responding to pollution will hold the owner of the system responsible for ensuring compliance with any consent parameters imposed on the site.

The Warranty and Maintenance requirements for these Commercial Sewage Tank products start from Page 12 of this document. The Warranty for the product will be dependent on all the installation and servicing guidelines being followed.

In the event of a warranty claim we will require information on the tanks servicing history.

Regulations and Guidelines

The following documents provide guidance on the requirements of design and installation of wastewater treatment plants.

Publicly available guidance documentation

- Northern Ireland Environment Agency Water (Northern Ireland) Order 1999
- The Environmental Permitting (England and Wales) Regulations 2016
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011
- Building Control Regulations 2010, part H Drainage and Waste Disposal, 2015 edition
- British Water Flows and Loads – 4, Code of Practice

Relevant Design and Testing standards

- BS EN 12255:2002
- BS 6297:2007+A1:2008

Tank sizes and construction

The Harlequin Commercial Sewage tanks are available from population equivalents of 51 up to 300. They are designed to treat domestic sewage to an average final effluent of less than 20mg/l Biochemical Oxygen Demand (BOD), 30 mg/l Suspended Solids, and 20mg/l Ammonia when the incoming flow and biological loads are within the limits for the plant as specified by us.

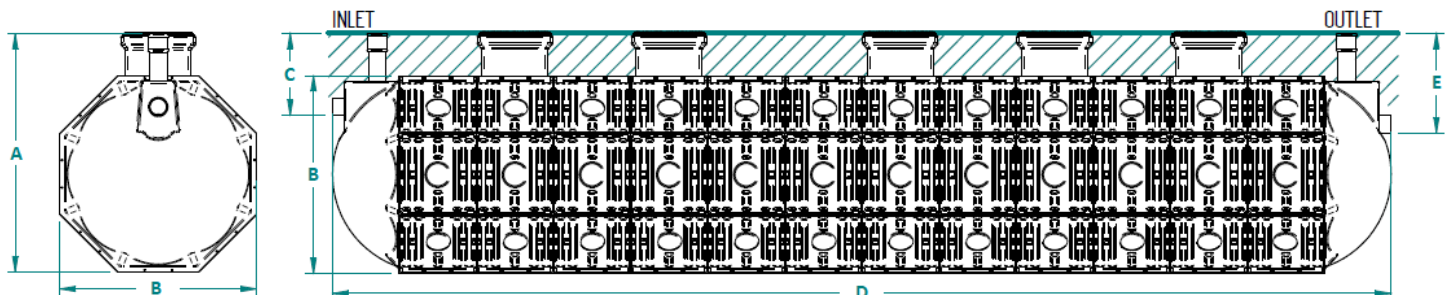
Commercial Sewage Tank Key Data:

8-sided (Octagon) Tank Dimensions:

They are manufactured using Sheet Moulding Compound (SMC) panels which are assembled in three different ring geometries (Octagon, Decagon and Dodecagon shaped bodies) depending on the population size along with fibreglass dome ends. This manufacturing technique allows significant flexibility in product sizing without the need for multiple toolings. The information in Figures 1-3 below lists the dimensions of several different sized models but bespoke sizes are available depending on the particular customer requirements. Please contact your local Harlequin Wastewater representative to discuss your individual product needs or the head office through info@harlequin-mfg.com.

Tank design features

The tanks will come fitted with multiple 600 x 600mm secure pedestrian duty manhole covers (designed to comply with statutory regulations). The number of covers will depend on the specific tank size to allow access to each chamber of the tank. All the tanks (8, 10 or 12 sided) have been designed with a flat base for stability during transportation and storage prior to installation.

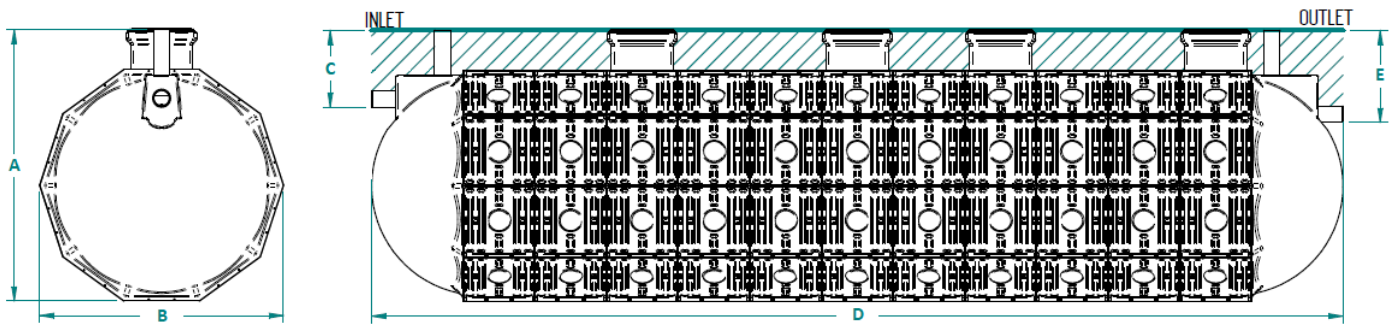


	A (mm)	B (mm)	C (mm)	D (mtrs)	E (mm)	No of Turrets	Power Requirements (KWhr/Day)	Unit Weight (kg)
HPOC-51	2350	1800	900	7.5	975	5	5.5	1190
HPOC-60	2350	1800	900	9.6	975	5	8.2	1440
HPOC-70	2350	1800	900	10.3	975	5	9.7	1560

Figure 1: 8-sided Tank key dimensions (example sizing)*

*All values in table are subject to change. Please contact your local sales representative for detailed product schematics

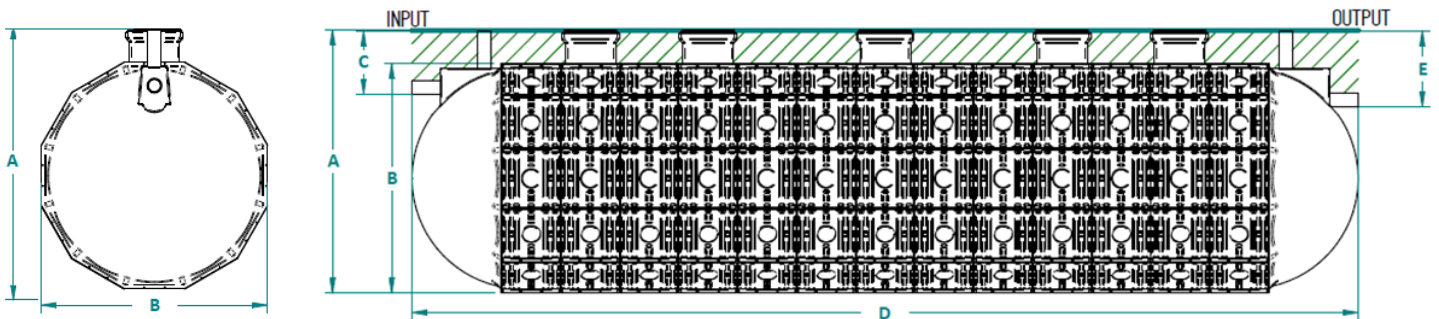
10-sided (Decagon) Tank Dimensions:



	A (mm)	B (mm)	C (mm)	D (mtrs)	E (mm)	No of Turrets	Power Requirements (KWhr/Day)	Unit Weight (kg)
HPDE-70	2810	2380	900	7.4	975	4	9.7	1410
HPDE-80	2810	2380	900	8.1	975	5	10.8	1600
HPDE-90	2810	2380	900	8.1	975	5	10.9	1660
HPDE-100	2810	2380	900	8.8	975	5	11.0	1800
HPDE-110	2810	2380	900	9.5	975	5	14.2	1930
HPDE-120	2810	2380	900	10.2	975	5	17.3	2070
HPDE-130	2810	2380	900	10.9	975	5	17.3	2200

Figure 2: 10-sided Tank key dimensions (example sizing)*

12-sided (Dodecagon) Tank Dimensions:



	A (mm)	B (mm)	C (mm)	D (mtrs)	E (mm)	No of Turrets	Power Requirements (KWhr/Day)	Unit Weight (kg)
HPDD-120	3270	2720	900	7.7	975	4	17.3	1920
HPDD-140	3270	2720	900	8.4	975	5	19.4	2200
HPDD-160	3270	2720	900	9.1	975	5	21.6	2400
HPDD-180	3270	2720	900	9.1	975	5	28.1	2500
HPDD-200	3270	2720	900	10.5	975	5	28.1	2800
HPDD-220	3270	2720	900	11.2	975	6	32.4	3050
HPDD-240	3270	2720	900	11.2	975	5	36.7	3150
HPDD-260	3270	2720	900	12.6	975	6	38.9	3450
HPDD-280	3270	2720	900	13.3	975	7	43.2	3700
HPDD-300	3270	2720	900	13.3	975	7	43.2	3800

Figure 3: 12-sided Tank key dimensions (example sizing)*

*All values in table are subject to change. Please contact your local sales representative for detailed product schematics

Tank handling

The transport contractor is responsible for offloading all items of equipment at time of delivery. When delivered, the customer should check the following:

- Check Tank and Kiosk/Blower boxes for signs of damage
- Ensure all lids and pipework are present
- Check all additional components have been delivered

Tanks should be set on a smooth level base that supports the entire structure of the tank and securely tied or propped to prevent them from overturning and causing damage or injury.

When installing the tank at location, they should ONLY be handled by crane or other designated and suitably rated lifting equipment using the provided strapping (only when empty).

- DO NOT use chains or wire ropes.
- DO NOT lift the tank if it contains any water.
- DO NOT subject the tank to sharp impacts.

The lifting equipment should include the use of a spreader bar to ensure the even distribution of the load (as shown in Figure 4). Harlequin recommends that the straps be distributed approximately every 1.5 - 1.8m of the tank.

The centre of gravity may not be at the centre of the tank so care should be taken to ensure the tank is stable during lifting and especially when lifting the tank into the excavation.

If the product is to be stored for a period of time before installation, please ensure that it stored on flat base that supports the entire structure of the tank. You should also inspect the tank before installation to ensure there has been no water ingress that could distort the balance of the load.

Please contact Harlequin if you require specific product drawings and dimensions of your product.

Plant Siting

The discharge from a wastewater treatment plant should be sited a minimum of 10m from any buildings. The distance of the plant from properties may vary from area to area but attention should be paid to the invert on the tank, the subsequent drain gradient on the inlet pipework and the potential of superimposed loads. Local building control office advice should always be sought through planning permission, where required.

The direction of the prevailing wind should also be taken into account when considering the plant location as odours may be present when the plant is being desludged or during maintenance. No odour should be present around the tank under normal operation providing the plant has been installed with the venting system (see 'ventilation' on page 10) and the plant has been correctly sized and installed.

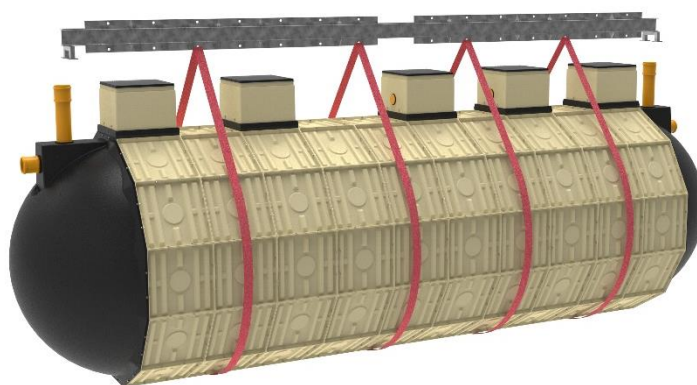


Figure 4: Illustration of correct lifting procedure

For installation, consider the space required on site to allow an excavator to operate; for the removal of soil, delivery of concrete, gravel, etc. For maintenance, consider the access space required for a sludge emptying tanker. Maximum distance of 20m is needed to ensure hose length is sufficient.

Approval for the tank position should always be sought from the controlling authority at an early stage and planning signed off by the local authority building inspector prior to installation.

If using a drainage field, attention is drawn to the minimum recommended distances to other buildings and sources of water which may affect your plant location:

- Drainage Field from habitable dwelling = 15m
- Drainage Field from water course = 10m
- Drainage Field from well/drinking water source = 50m

Drain gradients

Drain gradients from the dwelling to the treatment plant should be 1:40, although 1:80 can sometimes be permitted with approval of Building Control Officer. The gradient of pipes within a drainage field, if applicable, must be <1:200. The drain from the plant to the start of the drainage field should be in the range 1:40 to 1:80. These are only typical recommendations and must be approved by the Building Control Officer for specific sites.

Ground and drain levels

Site plans should show existing and proposed ground levels and invert depths of the drain throughout its length. If the drain is too shallow, or if it passes under walls and foundations, it should be protected by concrete surrounds.

Percolation tests and drainage fields

A soil percolation test should be carried out over the proposed drainage field where necessary. The calculations and drainage layout plan must be submitted to the Council Building Control dept along with the other drawings. The percolation tests should be carried out by a qualified specialist consultant who should be covered with professional indemnity insurance.

Superimposed loads/protected areas

Harlequin does not recommend that superimposed loads, such as vehicles, be allowed within 5m of any part of the tank.

The tank should not be situated close to a driveway or roadway, or anywhere there is a risk of it being subjected to additional superimposed loads. The protected area should also be fenced off.

If vehicular or other superimposed loads are required to come within the protected area a qualified civil/structural engineer must be employed to design the installation. This design must prevent loads being transmitted onto the tank.

Harlequin Tanks may not cover the warranty for the tank body under superimposed load conditions; this responsibility must be covered by the civil/structural engineer. It is thus a requirement that the installation is signed off by this third-party engineer.

Installation instructions

Before any tank is installed, appropriate ground condition checks should be made to determine the soil constitution, position of the water table and any flood possibility in the area.

These checks should be performed through test holes in the proposed area and checks with Building Control and the appropriate environmental regulator on any history of level alterations of the local water table. Failure to follow the guidance instructions during installation may render the warranty null and void.

When working in deep excavations, make sure that all necessary safety precautions are taken to ensure the stability of the excavation and provide safe working conditions for site personnel. The only time anyone needs to be working at the bottom of the excavation is when levelling the base and ensuring that the first backfill is correctly placed

Modifying the tank invert depth



Figure 5: Single 600mm x 600mm GRP riser fitted onto a Harlequin Commercial Tank turret

The Harlequin Commercial Sewage tanks come with a fixed drain inlet invert depth of 900mm. This invert depth

cannot be reduced further, but it can be increased with factory fit 600mm x 600mm risers. Harlequin recommends there should be no more than two of the risers used on each turret (a maximum drain invert of 1.7m). These risers cannot be retrofitted to the tank. If you wish to increase the invert (up to a max of 2m), you should use accessible 1200mm concrete rings secured on top of the tank, that are independently supported.

Failure to adhere to these design parameters may cause severe structural damage to the tank and will render any warranty null and void.

Ground installation conditions

All Harlequin Commercial Sewage tanks MUST be installed with a concrete backfill regardless of the ground water level surrounding the installation.

The maximum permissible water table level is 2.3m, 2.7m and 3.1m from the base of the tank for the 8, 10 and 12 sided tank respectively. Failure to follow the guidance instructions during installation may render the warranty null and void.

In poor soil conditions it is essential to make substantial provision for planking, strutting and temporary shuttering. If the complete surrounding soil structure is non-porous, eg, Clay or if the tank has been installed in bedrock etc, water will pool around the tank within the backfill. In this circumstance, a land drain should be installed to drain the installation to the base of the tank.

Adequate pumps should always be provided to keep the excavation free from ground water during the work. Provision should also be made for temporary covers and fencing around the excavation site to comply with statutory Health and Safety requirements.

Installation procedure

Excavations should allow for a minimum thickness of 300mm concrete all round and 150mm thickness of concrete below the tank. Where difficult ground conditions are encountered, ie, in unstable ground or shrinking clay, etc, an additional depth of 250mm should be excavated to allow for hardcore and sand blinding to provide a firm base for the concrete bed (see Figure 5 below for image)

Place wet concrete (slump test 30mm, strength 25N/mm²) in base of the excavation to a depth of 150mm, grade and level to within 20mm. The concrete must extend a minimum of 300mm all around from the vertical sides of the tank(s). This is vital to ensure a stable base to prevent settling of the tank(s) which could damage the pipe connections. **Place 50mm of wet concrete onto the hardened based and lower the tank onto the concrete and check it is true and level using a spirit level.** This is to ensure that the base of the tank is fully supported over the entire surface.

Fill each individual chamber of the tank to approximately 600mm water depth once the tank has been lowered onto the concrete. It is recommended that the water level is maintained evenly throughout the tank when

HARLEQUIN COMMERCIAL SEWAGE TANK INSTALLATION AND OPERATING INSTRUCTIONS

installing this tank. This will prevent any internal stress points that could damage the tank.

Continue to fill the tank with water and carefully place concrete around the tank building up the layers, ensuring that there are no voids remaining around the tank. Do NOT use a vibrating poker. Do NOT pour concrete directly onto the tank. Ensure that the level of water inside the tank is maintained at a level approximately 400mm higher than that of the concrete backfill.

Fill the tank with water until it reaches the height of the outlet pipe and bring the concrete level up to within 400mm of this level. The concrete must now be allowed

to harden – approx 24hrs. This is to prevent an unbalanced buoyancy force from the wet concrete from lifting the tank from the excavation as the backfill is raised above the internal water level. Ensure all turrets and access covers are sealed to prevent concrete entering the plant.

Once the backfill concrete has hardened, connect the inlet/outlet pipes to the tank and continue to backfill with concrete, covering the top body of the tank by at least 100mm thick layer. Complete to ground level with soil and/or flagstones.

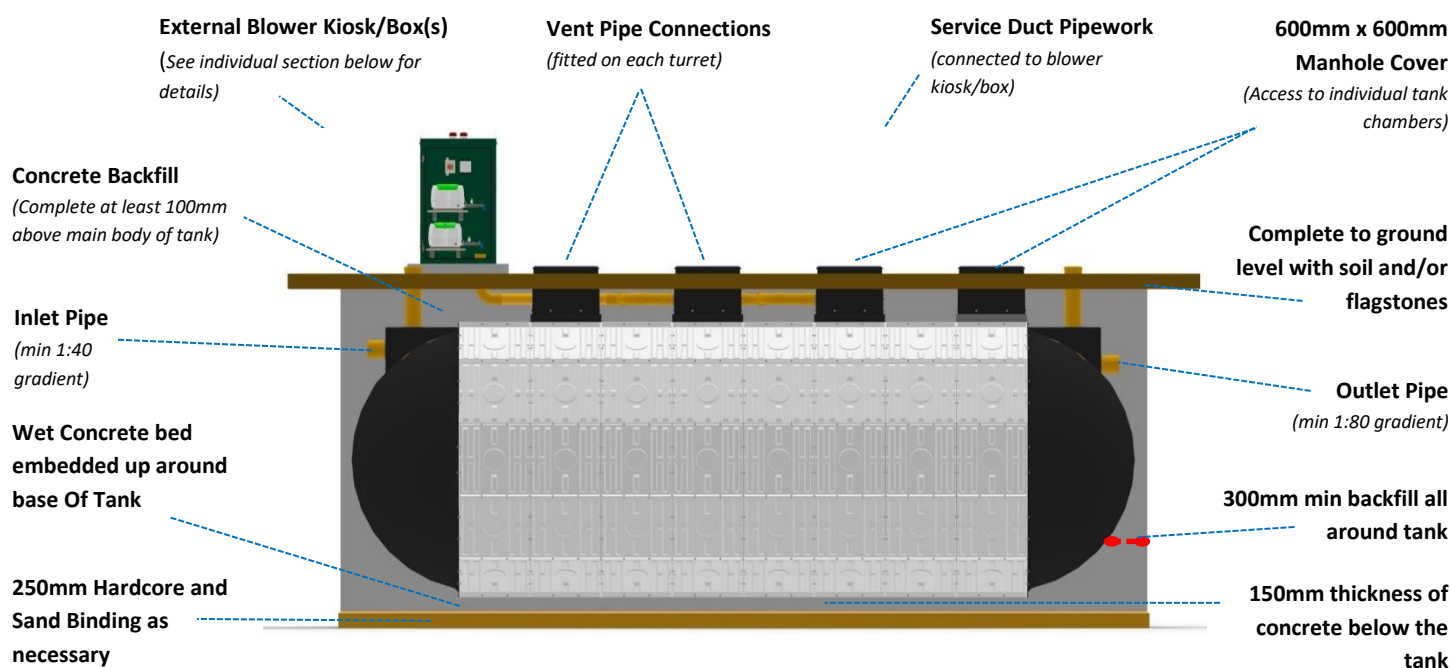


Figure 6: Typical Installation – Ground Conditions

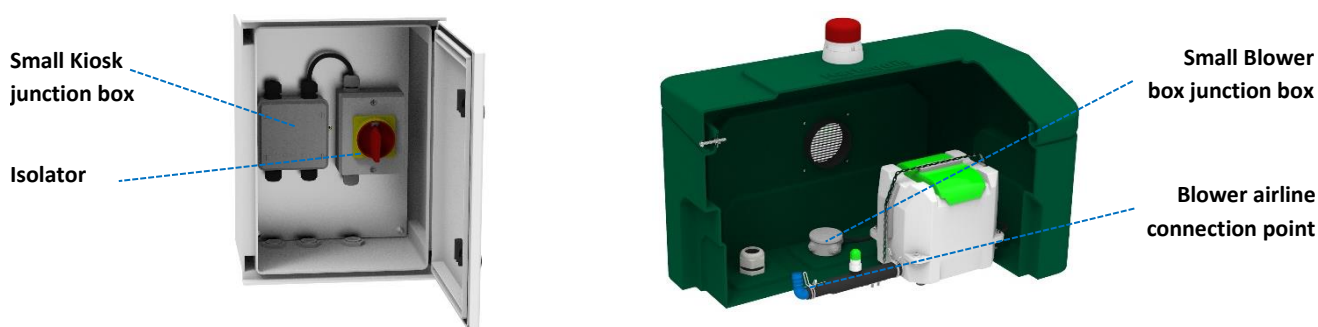


Figure 7: External kiosk and blower housing for units under 100 Population



Figure 8: External Blower kiosk for 100 Population units and above (pump specification may vary)

Electrical power requirements (Standard units)

Power requirement is single phase 240V, through a 3-core steel wired armoured (SWA) cable. Refer to the blower specification supplied with your unit for the specific power ratings to size the electrical cable but 1.5mm is usually adequate. The supply to the unit should be by means of a dedicated circuit with isolation and protection devices consistent with the requirements for fixed equipment and in accordance with the latest regulations. The electrical installation of this equipment must only be carried out by a fully qualified electrician.

Inside the External Blower Housing

Harlequin Commercial Sewage tanks will come supplied with an external blowing housing dependant on the size of the unit. Smaller units (up to 100 population) will come supplied with individual blower box assemblies (see Figure 7 above) containing a linear diaphragm blower unit, alarm, air hose and electrical connections along with a small control kiosk (with isolator switch and junction box). The blower boxes should be positioned close to the tank at ground level and this distance is limited by the length of airline provided (within 10m). The perforated metal straps used for transport to hold the blower in place should be removed prior to use.

The larger commercial tanks (100 Population and above) will come supplied with a blower kiosk unit (see Figure 8) that contains the air blowers, alarms, electrical connections and airline hose. As with the blower box assemblies, the unit should be positioned on a concrete base within 10m of the tank installation. Other specification of blowers and kiosks will be available in larger units but contact your sales representatives for product specifications.

If the tank is not to be installed upon delivery, we recommend storing the blower housing/kiosk at ambient temperature until ready to commission. We recommend shielding the blower housing(s) from direct sunlight when installed, as increased temperatures can reduce the

lifespan of the diaphragms. We also suggest there should be free air movement and no growth/obstructions around the blower housing(s) to ensure the optimum operation of the blowers.

The incoming power supply to the unit must be installed with a separate earth leakage circuit breaker in the source building. Ensure the SWA cable is correctly installed, earthing the outer steel armouring at both ends.

For the smaller units, the mains power can be brought into the control kiosk unit through the cable gland at the bottom of the box and connected to the mains isolator. The individual blowers will then need to be powered by connecting the junction box in the kiosk to the small junction connectors inside the blower box assemblies.

In the larger Blower kiosks, the mains power will need to be wired to the isolator inside the kiosk but the separate blowers will be pre-wired at the manufacturing stage

Connecting the airline to the tank

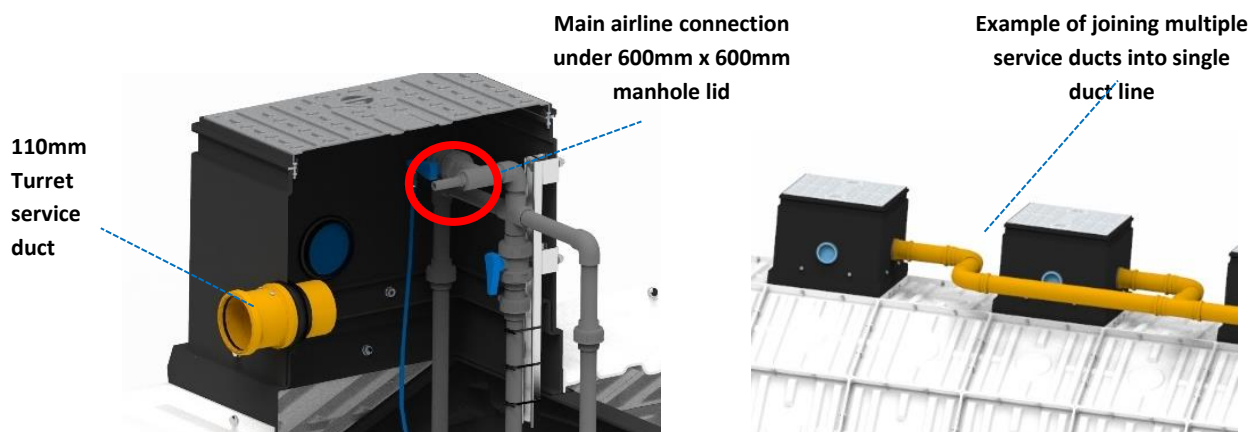


Figure 9: Tank Airline connection and Service duct

Harlequin Commercial Sewage tanks are manufactured with multiple aeration chambers and comes fitted with an access turret/lid above them. Each of these turrets is fitted with a 110mm service duct pipework to bring airlines back to the blower housings. We recommend combining the service ducts into a single pipework (an example is shown in Figure 9) and bringing back to the individual blower housings/kiosk in a way that prevent water ingress into the housing/tank.

In the small plants, the supplied airline should be fed through the large cable gland at the bottom of the Blower Housing (Highlighted in Figure 6) and connected to the blue plastic elbow/hose-tail on the air blower using a jubilee clip that comes in the kit. In the larger units, the airlines can be connected to the blue hosetails on the

blowers (as shown in Figure 7) and fed directly through the bottom of the kiosk.

The other end of the airline(s) should be cut to length, fed through the service ducting and joined to the fixed pipe hosetail connection installed on the tank just below the manhole lid above the reactor using the jubilee clips provided (as shown in Figure 9).

These tanks have a defined bespoke air blower/airline/diffuser assembly built within the aeration chambers. You should refer to your specific product documentation in regards the connections of blower units and modifications required to diffuser pipeworks after startup.

Operating the recirculation flow and balancing the diffuser airflow

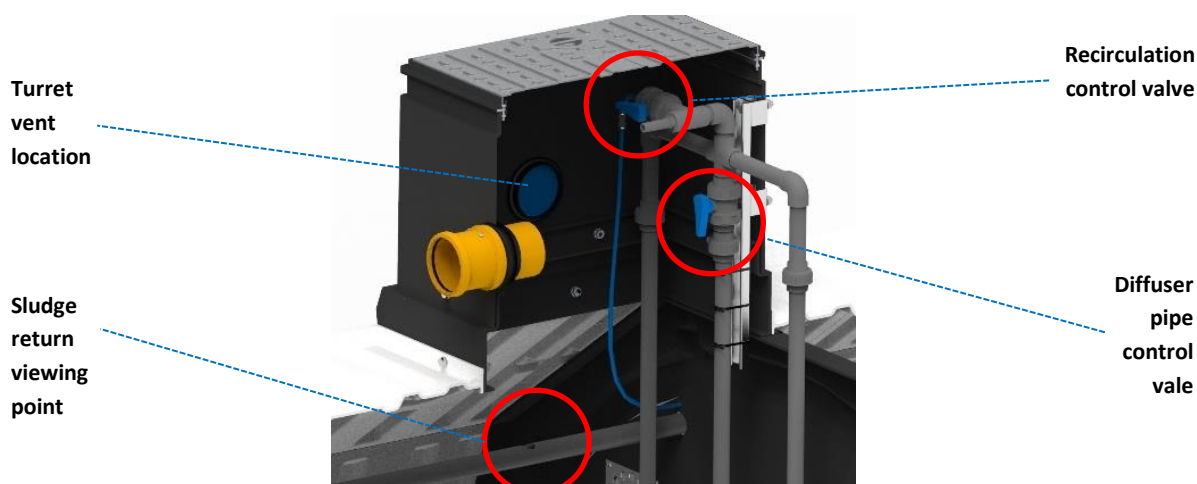


Figure 9: Tank Airline connection, Service duct and Venting location

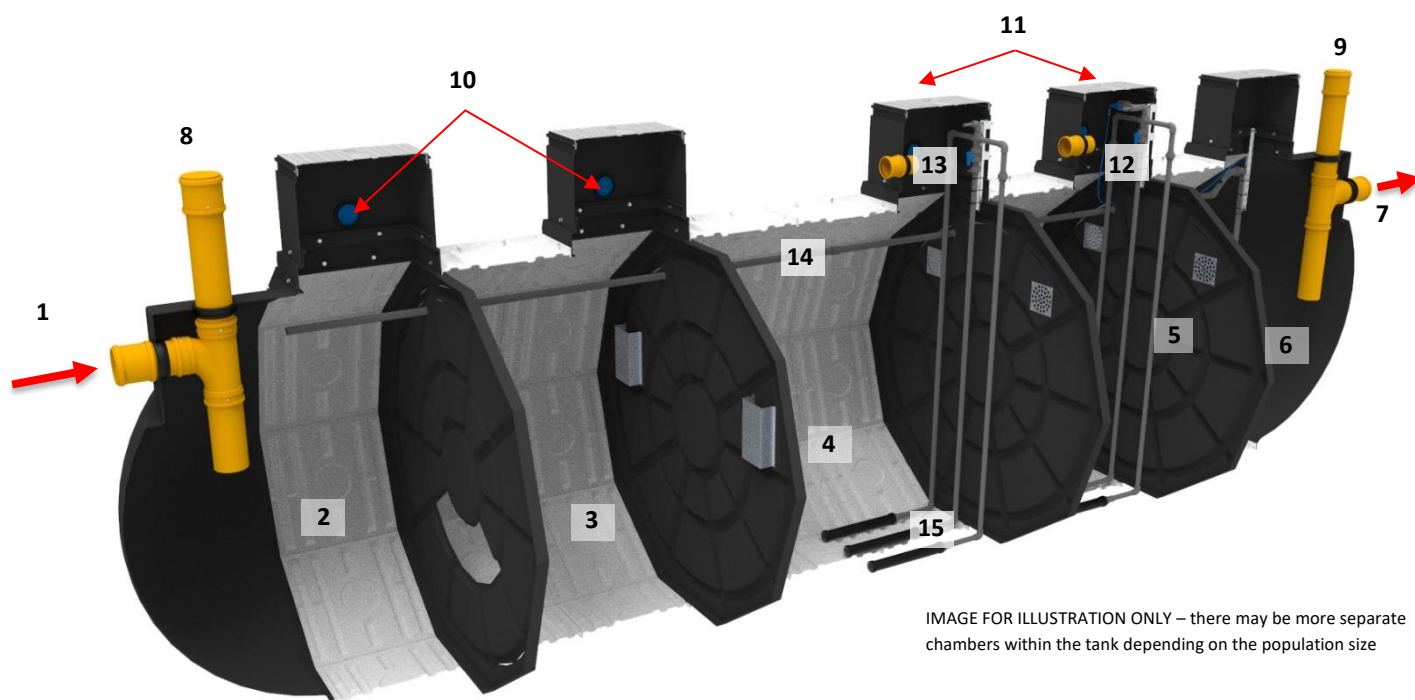
As mentioned above, each tank will have a bespoke airline/diffuser system. If there are more than 2 diffusers within a reactor chamber, the pipework below the main manhole lid may have control valves (as shown in Figure 9) to balance the airflow throughout the tank. If the airflow is higher in the central line(s), close off the valve slightly to reduce and balance the flow between all the diffusers.

These tanks also use a liquid recirculation/sludge return system connecting the bottom of the final settlement chamber back to the primary settlement chamber. The recirculation flow comes from an airline installed within that pipework. This airline is connected to the main air supply by means of a control tap fitted under the manhole lid in the first reactor chamber (Figure 9) which ensures the correct balance of flow between the recirculation pipe and the diffuser. This pipework allows the system to recirculate the effluent to prevent stagnation, especially in times of low influent loading.

Ventilation

It is important that a specific air venting point is provided by the installer to allow the system to freely vent and disperse gas. For every turret on a Harlequin Commercial Sewage tank (an example is shown in Figure 10), a 110mm vent pipe connection has been fitted to allow the air from the system to freely vent back to a remote vent location. This should terminate at a suitable distance and height from any surrounding dwellings to allow dispersal of air from the system.

Consideration should be given to the prevailing wind and any local site geography that might inhibit air dispersion. If in doubt as to the installation of an appropriate vent, please contact Harlequin Tanks for advice.



1	160mm Inlet	6	Final Settlement chamber	11	600 x 600mm Inspection Covers
2	First Primary Settlement Chamber	7	160mm Outlet	12	Air diffuser Control valve
3	Second Primary Settlement Chamber	8	Primary Settlement Rodding/ Desludge Point	13	Control Valve for Sludge recirculation
4	First Aeration Chamber	9	Final Settlement Rodding/ Desludge Point	14	Recirculation Pipework into Primary Settlement
5	Second Aeration Chamber	10	Example vent points connections	15	Fine Bubble diffuser

Figure 10: Process Description – HPOC100 (Air Blower & Electrics housed externally)

Operating Instructions

Operating principle and features

The Harlequin Commercial Sewage Tank is a biological aeration treatment plant designed to produce high effluent quality for safe discharge. It has several functions that minimise the amount of maintenance required for the system. These include:

- A Moving Bed Biofilm Reactor (MBBR) biological system that maximises bacterial growth without the potential for clogging in the system
- The bacteria receive a continuous air supply and are mixed and aerated by the high-volume fine bubble diffuser.
- There are no mechanical moving parts or electrical components within the tank. All functions are operated by air power generated by multiple air blowers situated close to the tank in an external housing/kiosk. This allows safe and easy maintenance.

Process description

Wastewater enters the first of three chambers, the Primary, where settlement takes place with the heaviest solids sinking and the floating matter rising. These solids are retained and stored in this chamber where anaerobic bacteria, ie, bacteria which do not utilise oxygen, break down the organic matter. A second separate primary chamber allows for the maximum retention time within the settlement phase. The second primary chamber is also fitted with scum baffles to prevent floating sludge passing through into the reactors.

The clarified water is transferred to the aeration chambers where it is mixed with freely moving plastic media elements. The media elements support large bacterial populations over their surfaces which are mixed with the water in the chamber.

Through contact with the bacteria, the organic and nutrient constituents of the water are removed. The chamber is continuously aerated by a fine bubble diffuser which provides the oxygen to nourish the bacteria. The air blower which drives the bubble diffuser is easily accessed for maintenance in the external housing.

The treated water finally flows through into a smaller final settlement chamber where any sloughed off bacteria or escaping solids are collected.

There is also recirculation pipework (sludge return) connecting the bottom of the final settlement chamber back to the primary settlement chamber.

The final effluent will flow by gravity through the 160mm Pipe outlet. From here the completely treated water will be discharged back into the environment either directly to a water course or through an underground drainage field. If the effluent is to be discharged to a higher level than the outlet of the tank, an external pump station should be considered.

Components inside the tank

There are no electro/mechanical moving parts within the plant, making the system very reliable and simple to maintain.

The air bubble diffusers in the reactor vessel can be disconnected from the airline pipework just below the main manhole access lid and removed from the tank for service if necessary. In the case of multiple diffusers, the pipework has been designed so that they can be removed individually. Rodding access is also provided on all pipework as per normal Building Control guidelines for underground drainage. All other components for the tank can now be found inside the External Blower housing.

Plant Start Up

1. Fill the plant with clean water until there is a discharge from the outlet. It is recommended that the chambers are filled equally to prevent any internal stresses between them
2. Check all the airline connections are connected per the instructions on Pages 8-10 to ensure air tightness
3. Check the ventilation around the blower housing is unobstructed.
4. Turn on the main power supply to the blower unit.
5. Turn the isolator switch inside the external blower kiosk/control kiosk to the on position. This will start the blower(s) running.
6. It will take a minute or so for the pressure to build up in the system depending on the distance of the blower from the treatment plant.
7. Check that bubbles are breaking the surface in each aeration chamber of the treatment plant.
8. Use the diffuser flow control valve (Figure 9) to ensure that the airflow is balanced between each of the diffusers. Repeat this in each aeration chamber
9. Use the recirculation control valve (Figure 9) in the first aeration chamber to set the airlift recycle from the final settlement chamber back to the primary settlement. This should be set to achieve a consistent effluent return rate. This may need adjustment due to temperature conditions or distance of blower from the treatment plant. Under no circumstances must this tap be fully open as this will detrimentally affect the process performance of the treatment plant.
10. If a pump station is fitted after the tank, refer to the specific installation guide to check for pump operation.
11. Refit all manhole covers and lock if necessary.

The wastewater treatment system is now in an operational state. However, the treatment process relies on the growth of microorganisms on the filter media. The time taken for these naturally occurring organisms to develop is dependent on temperature and may take up to six weeks in winter.

Until the biomass is fully developed, the treatment process will be incomplete. During this time do not allow any strong cleaning agents or bleaches to enter the system.

Plant Shut Down

Short temporary absences of flow to the plant will not be detrimental as sludge levels within the primary settlement should maintain the micro-organisms until flow returns. However, if the flow of sewage to the plant will be interrupted for more than two weeks, the following procedure should be completed:

1. Desludge the primary and final settlement tank compartments in accordance with the instructions below.
2. Refill the plant with clean water.
3. Fit the manhole cover and lock if necessary.
4. Stop the blower by turning the isolator switch to off.
5. Switch off the power supply to the blower enclosure.

Warranty

It is ultimately the customer/house owners' responsibility to ensure that their drainage and sewage treatment system complies with all statutory requirements.

Harlequin Manufacturing cannot guarantee the quality of effluent produced as we cannot control what enters the plant. The warranty policy covers the plant only and does not cover or guarantee an effluent quality. Drainage fields and the emptying of primary tanks remain the responsibility of the treatment plant owner.

The plant will have a 25-year extended warranty (if the product is registered with Harlequin – 5 years otherwise) that is valid from the date of sale – this warranty covers the body of the tanks. Ancillary equipment (excluding consumables) will have a 2-year warranty with registration (1 year otherwise) where a replacement will be delivered to site. This is subject to the tank being installed correctly according to the instructions listed in this guide and the servicing requirements being met. The warranty does not cover anything before or after the tank i.e. drainage field, venting and it does not cover damage done to the plant by any other product within the system.

In the event of a warranty claim we will require information on the tanks servicing history. During Installation, photographs of each stage of the process must be taken and recorded to ensure the unit has been installed correctly.

If a Harlequin Commercial Sewage Tank arrives on site damaged, it is to be reported by the end user / installer at the time of delivery/installation.

It is the installer's responsibility to check the plant internally for damage. It is also the installer's responsibility for the electrical supply, safety, connection, suitability and testing non-interference with other electrical systems as well as the ducting, hoses, venting and sealing.

The plant is not designed to have any non-biological waste going into the tank and is not suitable for any waste out with the plants design parameters. If a fault develops with the tank due to unsuitable waste entering the system this is not covered by the warranty agreement.

To ensure that the plant continues to operate efficiently, your attention is drawn to the following points:

DO NOT exceed the maximum design loading of the plant.

DO NOT allow surface water to enter the system.

DO NOT allow high volume discharges such as from swimming pools or Jacuzzis to enter the system.

DO NOT allow large quantities of non-biological waste/chemicals such as water softeners, disinfectants, strong acids or alkalis, oil and grease, pesticides or photographic chemicals to enter the system.

DO NOT use chemical or biological emulsifiers in grease traps.

DO NOT allow fats, oil or grease from catering applications to enter the system

In the case of an issue under warranty, Harlequin will be limited to either repairing a fault, issuing a replacement tank to site or refunding the original purchasing cost. The warranty does not cover installation, labour or other consequential losses.

Maintenance Schedule:

Desludging

As with any packaged treatment plant, it is extremely important that the tank is desludged and serviced at the prescribed intervals so that the maximum working life of the components is obtained, and that effluent quality does not deteriorate.

It is a requirement of the product warranty that desludging is performed at the required intervals. Proof of desludging, in the form of invoices clearly showing the desludging date, may be required. Failure to carry out regular desludging may affect your Harlequin product warranty. Failure to desludge the system at the appropriate time can also cause excessive solids to build up. This could result in solids washout which can pollute water courses or block drainage fields.

Harlequin recommends that during all desludge operations, the primary and final settlement chambers should both be emptied but it is possible to reduce the frequency of emptying the FST based on sludge levels. The primary settlement chamber should always be emptied first to avoid excess transfer of solids through the aeration chamber.

You can desludge the Primary and Final Settlement tanks through the 160mm access/rodding pipes or through the 600mm x 600mm manhole lids

It is important NOT to desludge the aeration chamber(s) which contains the active bacteria affixed to the media. This will stop your system operating correctly

Once desludging is complete the plant should be refilled immediately with water (waste or clean) to re-balance internal and external pressures on the plant.

Desludging intervals

We recommend that these tank systems be desludged at least once every 3 months. The desludging interval may be extended on sites where lower solid concentrations exist (ie a plant is not meeting its full utilisation) but the sludge level should not rise above 900mm before desludging. Contact Harlequin Manufacturing for further information.

Maintenance General Checks:

- Check the operation of the blower. If the blower has failed for any reason other than a mains power failure the warning beacon will be flashing.
- Check the operation of the diffusers (bubbles rising in the Biological zone).
- Check the inlet and outlet pipework (if possible) are clear of debris. (Remove any obstructions).
- Check the blower ventilation is un-obstructed.
- Check the biomass growth on the filter media. The biomass should be a light brown colour, not white or grey. The odour in the plant should be 'earthy'. There should not be a noticeable 'rotten eggs' smell.
- Check the final effluent. If this is cloudy or contains many suspended particles, then the final settlement tank is likely to require desludging.

Filters: It is a recommendation that the air blower filter be checked/cleaned/replaced (if necessary) every 3 months, particularly on sites which are prone to dusty conditions. Service kits and instructions for the checking/replacement of a filter are available on request. The warranty on the blower unit is subject to the filter quality being maintained.

Diaphragms: The working life of the diaphragm depends on the operating conditions and the work environment but for optimal operation and both parts need to be replaced every 12 months. The warranty on the blower unit is subject to the diaphragm being maintained. Diaphragms kits and instructions are available on request.

Valve Boxes: It is recommended by the manufacturer that these covers are replaced every three years to maintain optimum performance.

24-monthly intervals

A full service on the plant should be performed. The service should ensure that all aspects of the system are functioning correctly.

Particular areas of detail include:

- Checking all chambers for damage
- Checking the full air system including the air blower and diffusers
- Checking lid seals and air blower chamber
- Checking ventilation system
- Checking electrical connections at the plant.

FINAL INSTALLATION CHECK LIST

Tank Installed correct distance from property	☐
Tank installed on a flat concrete base	☐
ALL Chambers filled evenly with water before back-fill commences	☐
Tank backfilled with concrete	☐
Blower housing fitted securely and within 10m of the tank body	☐
Air hose cut to length and connected to blower box and tank connections securely	☐
Perforated metal straps securing blower removed prior to use	☐
Electrical installation completed and Air blower running	☐
Effluent return is operating at consistent level with no air bubbles in final chamber	☐
Check Diffuser is in correct position with air bubbles passing up through media evenly	☐
Customer has been advised on desludging and servicing of tank	☐
Customer has been given copy of Installation and Servicing Guide	☐

HARLEQUIN COMMERCIAL SEWAGE TANK INSTALLATION AND OPERATING INSTRUCTIONS

Fault Finding

Symptom	Cause	Action (all work must be performed by a specialized company)
Strong smell	Blocked or damaged air diffuser	Remove the diffuser; clean or replace if necessary
	Ventilation	Ensure tank is properly vented back to suitable remote location
	Blocked or damaged air hose	Change the damaged hose, unblock it if necessary
	Kinks/bends in the air hose	Change damaged air hose
	Air escaping from joints	Check connections and tighten them if necessary
	The joints of the pipes are damaged	Check and replace the seals if necessary
	The air diffuser is no longer at the bottom of the tank	Re-Install the diffuser at the bottom of the tank,
	High sludge level	Arrange a desludging of the tank
	The diaphragm of the compressor is damaged	Replace the diaphragm
The treated water is of poor quality	The air diffuser is clogged or torn	Remove the diffuser; clean or replace if necessary
	Blocked or damaged air hose	Change the damaged hose, unblock it if necessary
	Kinks/bends in the air hose	Change damaged air hose
	Air escaping from joints	Check connections and tighten them if necessary
	There is an organic overload because of the use of garbage grinders	Compost biological wastes
	High sludge level	Arrange a desludging of the tank
	There is no power supply	Check power
	The diaphragm of the compressor is damaged	Replace the diaphragm
Treated water contains large amounts of solids	High sludge level	Arrange a desludging of the tank
	Excessive use of the washing machine	Minimise continuous use of equipment that will dispose to the tank
Fat build-up within the tank	Excessive use of the washing machine	Minimise continuous use of equipment that will dispose to the tank
	Excessive fatty components coming to tank through waste streams	Separate fatty waste streams and minimise amounts going to tank
	The air diffuser is clogged or torn	Remove the diffuser; clean or replace if necessary
	Blocked or damaged air hose	Change the damaged hose, unblock it if necessary
	Kinks/bends in the air hose	Change damaged air hose
	Air escaping from joints	Check connections and tighten them if necessary
High water level (above the pipes)	Blockage in the pipes	Clean all pipes (Inlet, outlet and inside the tank where possible)

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Air Blower warning	Issue with the Air Blower	Check the power supply, the diaphragm and air filter. Replace/repair if necessary
There is no recirculation flow from the final settlement tank	Issue with the Air blower	As above
	Recirculation pipework is blocked	Use a wooden pole to agitate any sludge which has settled around the bottom of the recirculation pipework in the final settlement tank. If there is a substantial level of sludge, then arrange a service
	No air getting to the recirculation line	Check that the air control valve has been opened to a suitable level so that a limited constant flow of liquid is achieved
	The air control valve is blocked	Remove and clean the valve. In cleaning the valve, ensure the part is not damaged
	Air bubbles in Final Settlement tank	Check the connection of the blue airline and ensure that the control valve is not turned on too high
Higher Noise Levels	Issue with the Air Blower	Ensure that the perforated metal straps holding the unit down within the external blower housing have been removed
		Check the diaphragm is not damaged

HARLEQUIN COMMERCIAL SEWAGE TANK INSTALLATION AND OPERATING INSTRUCTIONS

Appendix 1: Service History

Service Date	Maintenance Details (Service/call out/de-sludge)	Signature (with Company name)