Pump stations Installation and operation manual





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Based in Northamptonshire and with extended facilities in Bridgwater, Somerset, Marsh Industries is a leading manufacturer of off-mains drainage products and rainwater harvesting systems for both UK and overseas markets.

Marsh supplies pump stations and off-mains drainage products for domestic, commercial and industrial applications as well as offering engineering design and technical support.

With one of the largest merchant distributor networks available in Europe, clients ask for Marsh products and services because they know the company delivers from a solid foundation of knowledge, customer support, product quality and proven performance.

Architects, specifiers and installers within the construction sectors seek alliances and partnership with Marsh because its core products and services bring further added value to their own brands.

Note: Marsh Industries accepts no liability for any damage or loss, including consequential loss caused by the failure of any drainage equipment.

It is the responsibility of the installer/contractor to undertake installation of the pump station as per the manufacturer's instructions.

Marsh Industries believe that the information printed in this manual is accurate, and published for information only. No warrants, express or implied, are contained therein, nor does any legal liability attach to Marsh Industries for any reason whatsoever. The company's policy is one of continuous product improvement and we reserve the right to make alterations to our range and specification without prior notice.



1 Pre-installation checklist

Prior to installation please check or take note of the following:

- ✓ Ensure that the information contained in this manual is adhered to at all times.
- When the pump station arrives on site it is recommended to fully inspect for damage (ie, fractures to the shell or ribs, delamination, scratches or abrasions deeper than 1.5mm or stress cracks). If any damage is seen or suspected please notify Marsh Industries immediately as problems cannot be rectified easily after installation.
- It is the responsibility of the installer/contractor to undertake installation of the pump station as per Marsh Industries' instructions.
- ✓ All electrical work must be undertaken by fully qualified personnel under the guidance of The Health & Safety at Work Act.
- ✓ Ensure the tank is properly ventilated.
- \checkmark The end-user of the pump station is responsible for the operation and maintenance of the system.
- It is important that the product is operated under the conditions for which it is designed. Any variation in these conditions could prevent the unit from performing to its full potential.
- ✓ Maintain the system in accordance with this handbook.
- ✓ Do not open access covers without isolating the mains power first (panel isolator must be turned fully to the OFF position).
- The end-user/installer must provide cable ducts to the control panel and between the control panel and the pump station. See 'Electrical installation'.
- Incorporate a suitable protective device in the power supply to the unit. If the circuit breaker trips, the unit will stop running a
 dedicated protective device is recommended.

To maintain optimum system performance the end-user must be aware of certain precautions, including the following:

- X Do not alter in any way, any part of the system or internal parts supplied with the system.
- X The design loading of the pump station should not be exceeded.



2 Introduction

This manual is supplied with your pump station for the provision of installation, operating and maintenance instructions. It is the responsibility of the operator to read and fully understand these instructions before commissioning or operating the pump station. In the event of problems occurring with your pump station you may either refer to this manual, your equipment supplier, service company or Marsh Industries.

The pump station will provide long and trouble free operation provided the maintenance procedures laid out in this manual are regularly carried out.

Your attention is drawn to the Health and Safety section. It is imperative that you read these instructions before working on the system.

3 Health and Safety

Section 6(a) of United Kingdom Health and Safety At Work Act 1974 requires manufacturers to advise their customers on the safety and the handling precautions to be observed when installing, operating, maintaining and servicing their products.

- O Before carrying out any maintenance work, the equipment must be electrically isolated.
- **O** DO NOT leave covers/manways open for any longer than is necessary.
- O Temporary barriers and warning signs should be erected around any open covers/manways as appropriate.
- O On completion of works to the pump station all access covers must be replaced.
- For sewage pumping stations, sewage gases are potentially hazardous. DO NOT enter the unit without proper training and undertaking a confined spaces risk assessment process, with all required equipment and personnel being present.

The user's attention is therefore drawn to the following:

- O The appropriate sections of this manual must be read before working on the installation.
- O Installation and servicing must only be carried out by suitably trained or qualified personnel.
- O Normal safety precautions must be taken and appropriate procedures observed to avoid accidents.
- All works associated with the installation must be adequately risk assessed and all appropriate control measures in place prior to starting any work.

General non site specific significant hazards that are associated with the operation of the pump station include but are not limited to:

- O Explosive atmospheres
- **O** Falls from working at height
- O Confined space working
- o Electrical Shock
- **O** Asphyxiation
- O Working near, in, or over water
- O Exposure to dangerous substances, chemical and biological
- O Being struck by falling objects
- O Moving heavy loads



- O Slips and trips
- O Entrapment or crushing by a workplace vehicle
- O Bad working positions, often in confined spaces
- O Receiving injuries from hand tools
- **O** Inhalation of contaminants
- O Handling of rough materials
- O Loud noise
- **O** Vibration from tools or vibrating machinery

If further technical advice or product information is required refer to your service company, local supplier or Marsh Industries.

Confined space

- Generally it should not be necessary to enter the pump station under normal working and operating conditions. Adjusting the gate valves and maintenance of the non-return valves requires entry into the tank and for deep tank installations the operative may need to be suspended within the tank. Dangers can arise in the confined space because of the following issues:
- **O** A lack of oxygen where heavier gasses or vapours displace breathable air.
- O Poisonous gas, fume or vapour that can remain in the tank even after the system is emptied.
- O A sudden filling of the tank where there is a failure of the inlet bung during maintenance that occurs in periods of high rainfall.
- **O** Fire and explosion hazards from flammable vapours and liquids.
- O Residues on the inner surface of the tank that can give off fumes/vapours and could also result in poor footing conditions.
- O Hot conditions leading to a dangerous increase in body temperature due to poor ventilation.
- **O** Injuries resulting in falls from a height; the access to the pump station is at ground level but they can be in excess of 4 meters deep.

You must carry out a suitable and sufficient assessment of the risks for all work activities to decide what measures are necessary for safety. All those involved in the works must be adequately trained in confined space and ensure that permit to work and safe systems of work are in place for works within the tank and operations around the tank. The following checklist includes essential elements that must be considered when preparing a safe system of work, it is generic, not site specific and must not be considered as an exhaustive list:

- O Appoint a supervisor with the responsibility to make sure that the necessary precautions are taken.
- Ensure that individuals involved with the works are competent and in adequate physical condition to complete the works. It may be necessary to seek medical advice on an individual's suitability.
- Isolate all mechanical and electrical equipment serving the tank ensuring that shut off valves are locked off and probes removed from the tank or disconnected as necessary.
- **O** To minimise the build-up of gas, vapours and fumes the tank may be cleaned before commencement of the works.
- O Ensure that equipment used by operatives is suitable and does not impact on the individual's ability to enter and exit the tank safely.
- **O** Mechanical assist equipment should be considered for access and egress into the tank.
- Ensure that all openings to the tank are open and if possible increase ventilation using forced air/mechanical means to assist in preventing the build-up of toxic gas, vapours and fumes.
- Testing the air may be necessary to check that it is free from both toxic and flammable vapours and that it is fit to breathe with testing being performed by a competent individual.
- O Non-sparking tools and specially protected lighting are essential where flammable or potentially explosive atmospheres are likely.



- Breathing apparatus is essential if the air inside the space cannot be made fit to breathe because of gas, fume or vapour present, or lack of oxygen.
- Prepare emergency plans where emergency arrangements will need to cover the necessary equipment, training and rescue operations.
- Rescue harnesses should be provided with lifeline where the lifeline is run back to a point outside the confined space to assist in rescue operations.
- An adequate communications system is needed to enable communication between people inside and outside the confined space and to summon help in an emergency. A suitable competent individual may be required to communicate with anyone inside, raise the alarm quickly in an emergency, and take charge of the rescue procedures

Health

It is the customer's responsibility to ensure that all necessary personal protective clothing/equipment (PPE) is available. As a minimum it is recommended that the following PPE is used:

- **o** Overalls
- O Gloves (waterproof, cut, tear and abrasive resistant)
- **O** Waterproof safety boots
- Hard hat
- O Breathing apparatus (where entry to the sump is required)

After operating and maintaining the system, it is imperative that a high level of personnel hygiene (hand washing, etc) is immediately undertaken. Leptospirosis is a disease which can, in rare cases, be contracted from contact with sewage.

There are two types of Leptospirosis infection which affect people in the UK. Only one of these types is associated with sewage. Weil's disease is a serious and sometimes fatal infection that is transmitted to humans by contact with soil, water or sewage contaminated with urine from infected rats.

Responsibility

The owner of the pumping station is entirely responsible for ensuring correct operation. The offloading, correct installation and commissioning of the pumping station is the responsibility of the system owner. We strongly recommend that a contractor that understands packaged pumping stations and drainage systems installs the unit.

The location and form of the discharge from the pump station is the responsibility of the station owner. Responsibility for the installation and maintenance of the pump station remains with the owner.

Marsh Industries recommend a professional service company, employing service engineer's familiar with pumping equipment, is used to service the unit. Marsh Industries accepts no liability for any damage, loss (including consequential loss), third party costs caused by the failure of any equipment supplied.



4 Unit description

The pump station system is comprised of the following items:

- 1 GRP pump chamber
- 2 Pumps, discharge pipework and float switches within the pump chamber (note: pumps are not installed in the pump chamber at time of delivery unless the pumps are free-standing)
- **3** Control panel (may not be included if pump chamber houses a single pump)
- 4 Kiosk (optional)
- 5 An external beacon (optional)

1 GRP pump chamber

Typically the GRP pump chamber will have the following connections (pumps are housed in a sump within the GRP tank):

- **o** 1 x inlet socket
- **O** 1 x outlet (pumped) connection
- 1 x cable duct socket (110mm minimum size)
- O 1 x vent socket (to enable the station to be connected to a vent system by others)

2 Pumps, discharge pipework and float switches

The pumps have been carefully selected to give the optimum forward flow rate at the lowest running cost. The pump station is supplied with two pumps controlled by a float switch system. A duty/standby or duty assist configuration may be used whereby two pumps are employed. A non-return valve is fitted at the outlet of each pump with a common gate valve.

3 Control panel

The control panel has an interlocked incoming supply isolator, making it difficult to remove the cover without first electrically isolating the control panel. Installation of the pump control panel will need to be located in a building or kiosk unless specified otherwise. Ensure when working on the pump control panel that power to the panel is isolated to avoid electrical shock.

The electronic control panel incorporates the mains isolator, alarm contacts, and terminals for pumps and float switches. Please note that the installer is required to provide a dedicated mains supply to the control panel with D-rated Fuses.

When a control panel is supplied a beacon will also be supplied as standard and is powered by the control panel. When an alarm condition occurs the beacon is energised to indicate externally that a high level condition exists in the pumping station.

In a dual pump system the control panel energises the duty pump using control floats. The pump is called to run when start float is activated and allowed to run until stop float deactivates pump.

The control panel allows for alternate duty on energising pumps so that both pumps are run evenly preventing excess wear on any individual pump.

If a pump overload condition exists then the control panel overload will trip. When this occurs the other pump is automatically energised.



5 Installation

Please read health and safety instructions before commencing installation work.

Pump stations are suitable for installation with concrete backfill only.

The following instructions are offered for guidance only. Marsh Industries accepts no responsibility for incorrect off-loading or installation.

General

- O These guidance notes refer only to the installation of Marsh Industries' underground GRP tanks suitable for concrete surround.
- O These guidance notes do not provide specific, site-related installation instructions.
- O If in any doubt about any aspect of the installation please contact Marsh Industries on 01933 654582.
- O Generally the depth from finished ground level to the top crown of the main tank shell should be no more than 1.3m meters.

Transportation, unloading and storage of tanks

- **O** Tanks must be held down during transportation using nylon straps, do not use chains, cables or wire ropes to hold tanks.
- O Do not over tighten straps, causing deformation of the tank shell.
- O Tanks are best lifted by a crane utilising webbing lifting straps do not allow chain, cable or wire rope to be in contact with the tank.
- O It is recommended that a lifting beam is used for tanks longer than 8 meters.
- Smaller tanks may be lifted with other suitable site equipment, but greater care is needed to control the lift and to ensure the tank is not damaged.
- Not all tanks will have their centre of gravity at the centre of the tank. Therefore, the lifting straps need to be arranged to ensure the tank is stable during lifting.
- O Move tanks only by lifting and setting, do not drag or roll.
- **O** Do not drop or roll tanks from the delivery vehicle.
- Place tanks carefully onto a smooth, level and even surface that is free from rocks, large stones or other debris that could cause point loads on the tank shell.
- O In high wind conditions, consideration should be given to strapping down the tanks to prevent damage.

Pre-installation inspection

- Tanks should be subject to a visual inspection prior to installation. Special consideration should be given to strap positions. Check for fractures to the tank shell or ribs, delamination, scratches or abrasions deeper than 1.5mm, stress cracks or star crazing.
- **O** Any damage should be notified to the delivery driver and to Marsh Industries.
- **O** Do not undertake any unauthorised repairs, as this will invalidate the tank warranty.
- Check the invert depth is correct, the tank is correct grade for concrete surround and that the inlet and outlet pipe orientations are correct
- Where present, all fixings (nuts, bolts, screw fixings etc) should be checked and retightened to correct any movement during transport.

Excavation

• Excavations should be planned with due regard to Health and Safety requirements, and should be either shored or battered back to a "safe" angle.



• Ground instability at formation level, eg, running sand, may necessitate over-excavation and stabilisation with hardcore or blinding concrete.

Concrete specification

The specification for the concrete mix to surround the tank should be selected by the tank installer taking into account the site conditions and application requirements.

For a typical non-structural application in good ground conditions, with non-aggressive soils, a concrete with a 28 day compressive strength of 20 to 30N/mm² with a 25 to 50mm slump, complying with the relevant BS EN standards, is generally suitable. For non-typical applications, aggressive soils or structural applications specialist advice should be obtained.

Lift height (rate of rise)

Determine the lift height (m), or rate of rise (m/h) for the specific concrete type used, to ensure that a design pressure (P max) of 15kN/m² on the tank is not exceeded.

Vibration

The design of the tank assumes minimal compaction of the surrounding concrete. Where necessary, this may be extended to include light internal vibration. Do not use deep reverberation which will substantially increase the pressure on the tank, possibly causing failure.

Impact of concrete on discharge

The effects of concrete discharge impact are considerable. These effects must be considered to ensure the maximum pressure of 15kN/m² on the tank is not exceeded. Under no circumstances should concrete be discharged directly onto the tank.

Live load

If the tank is installed in an area where traffic, or other superimposed loadings can be applied, a structural engineer should be consulted, to design a reinforced concrete slab spanning over the access hatch of the tank. This is to prevent the load being transmitted to the tank. If this slab is constructed immediately above the tank, it should be separated from the concrete surrounding the tank by compressible material.

Tank burial depth

The grade of tank is designed to be installed below ground and completely surrounded with concrete.

Generally, the depth from finished ground level to the top crown of the main shell should be no more than 1.3 metres. This may vary dependent upon ground water conditions. Deeper inverts may be accommodated on a standard shell providing the water table level does not exceed two metres above the top crown of the main shell. For deeper burial with high water table conditions heavy duty shells are available. If the tank is installed outside these parameters it may suffer irreparable damage.

Control of groundwater

Tanks must not be subjected to buoyant forces during installation, taking account of ground water levels and surface water run-off, and their accumulation in the tank excavation. This applies even if the tanks are mechanically anchored.



Excavation = tank diameter + 450mm

Excavation = tank length + 450mm



Installation procedure

- Maintain a completely dry excavation until the final pour of concrete has set. Failure to do this may result in voids beneath the tank and subsequent tank failure.
- Place the concrete in the base of the excavation to form a level and smooth base onto which the tank can be placed. The base concrete thickness should be no less than 200mm.
- Place the tank onto the concrete base, while the concrete is still wet, and determine the correct orientation for the tank pipework. Connect the pipework to the tank, ensuring correct alignment.
- Fill the tank with clean water to a depth of 300mm and recheck the pipework levels and connections. Commence backfilling evenly around the tank with concrete ensuring there are no voids, particularly at the bottom of the tank shell. Continue filling the tank chamber(s) with water whilst evenly backfilling with concrete around the tank ensuring that the progressive water level is no more than 300mm above the concrete level.
- Connect and seal turret extensions prior to completing the concrete encasement of the main tank (if turret extensions have been included). Allow the concrete to cure.
- Using appropriate formwork continue pouring concrete around the tank superstructure, i.e. access turrets, in lift heights not exceeding 500mm, allowing the concrete to set between each lift. The lift height, rate of concrete rise, or concrete compaction must not be to an extent which causes any part of the tank superstructure to distort, as this will damage the tank.
- Complete the backfill to ground level using free flowing granular material. Trim all access turrets and prepare suitable footings for each manhole frame ensuring any loads on the covers are not transmitted to the tank access turrets or access extensions, if fitted.

Access shaft extensions

Access extensions should be surrounded with concrete poured in 500mm lifts, allowing an initial set between each lift. The pressure from concrete placed in higher lifts may cause access extensions to distort or collapse.

Loose shafts should be sealed using silicon sealant, butyl tape or similar prior to installation to prevent ingress of groundwater under high water table conditions. It is the installation contractor's responsibility to ensure a watertight seal.

Electrical installation

It is not possible to state a specific installation configuration that would suit all sites. To ensure a safe and cost effective installation, the selection of current protection devices and the power cable feeding the control panel is the responsibility of the installer as the person best qualified to assess site conditions and supply configuration.



It is imperative that electrical installation of this equipment is entrusted to a fully qualified electrician. When installing the electrical supply to the pumping station, the following points should be considered:

- Pumps and float switches are provided with 10 metres of cable as standard unless specified otherwise. For longer cable runs between pumps/floats and control panel the installer will need to fit junction boxes and additional cables. Interconnecting cables between the junction box and control panel must be terminated with weatherproof glands.
- The supply to the pumping station control panel should be provided by a dedicated circuit via isolation and protection devices consistent with the requirements for fixed equipment and in accordance with the latest regulations of the Institute of Electrical Engineers.

Pump installation

The pumps should be installed ensuring that they do not hinder the operation of the float switches. The pumps should be lowered into the tank using the chain provided and located onto the auto coupling fitted in the base of the tank.

The assist float should be installed such that the second pump is started before the effluent backs into the incoming pipe invert level.

The high level float should be installed such that the alarm operates to indicate that the inlet pipe is full and now will be backing up flows in the upstream drainage.

All float switches should be installed such that they can move freely, and operate without becoming caught in any one position.

Failure to comply with the following could result in the invalidation of warranty:

- O All connections made to the control panel should be via correctly sized and rated glands;
- Check all power terminations for tightness prior to commissioning. Loose connections will cause localised overheating with the possibility of fire.
- The control panel should ideally be sited within the 10 meter cable run of the unit. Suitably sized cable, protected in a cable duct or suitably sized steel-armoured cable should be used to run between the control panel and the electrical supply point. All glands used in the kiosk (optional), must be weatherproof.
- Correct installation of the pump station is required for optimum system operation and is a requirement for the pump station warranty to be valid.

Pump station start-up procedure

Start-up and commissioning

Note: The unit should be commissioned before flow is allowed to enter the system. Electrical connections and cabling should be undertaken and checked by a qualified electrician.

- O Check the correct installation of the outlet pipework, and ensure that the delivery isolating valve is open.
- **O** Ensure the pump station, incoming and discharge pipes are free from rubble and building debris.
- O Fill the chamber with clean water, up to the level of the high level float switch.
- **O** Turn the control panel isolator to the ON position.
- Check operation of the pump, ensuring that the level in the chamber drops until the float switch stops the pump. Allow the level to rise, and observe a second 'start' / 'stop' cycle.



- Turn the isolator to the OFF position.
- O Fill the chamber with clean water, until the assist control float switch (optional) and the high level alarm are covered.
- **O** Turn the isolator to the ON position.
- O Check the high level alarm condition is indicated on the control panel.
- O If configured for duty/assist operation check both pumps are in operation.
- As the water level drops and the high level alarm float tips such that the float indicates empty, check the high level alarm condition on the control panel is cancelled.
- O As the water level drops and the assist level alarm float tips such that the float indicates empty, the second pump is de-energised.
- **O** The first pump runs until the chamber is at low level.
- O Allow drainage to enter the pumping chamber.
- **O** Replace the tank cover and the pumping station is now operational

Pump station shut-down procedure

- O Switch the control panel isolator to the "OFF" position and padlock.
- **O** The pump(s) should be raised above the level of the residual liquid or removed completely.

6 Maintenance

Please read health and safety instructions before commencing maintenance work.

General

Correct and timely maintenance is a key requirement to ensure that the pump station operates correctly.

Marsh Industries recommend a professional service company that understands pump stations and drainage systems is used to service the pump station.

The maintenance activities can be summarised as follows:

- O Ensuring debris does not accumulate in the pump station
- O Ensuring correct Float Switch operation
- **O** Ensuring correct pump operation

The following must not be discharged into the drains:

- O Cleaning rags
- **O** Cloths
- O Syringes and hypodermic needles
- O Medicines and medical equipment. Take unused medicines to a pharmacist for safe disposal.
- Grease and fat. These products tend to cool down, separate from the water and coagulate within the pump chamber. Fat & grease encase the pump and floats, causing blockages and failure of pumps.
- O Nappies, sanitary towels, incontinence materials, soft toys, tennis balls etc.
- Even disposable nappies and sanitary towels often do not degrade fully and can lead to malfunction, so it is best to dispose of them by other means. Fabric cleansing wipes & nappy liners can block pipework. They should not be flushed into the drainage system.



Monthly

- **O** Check the operation of the pump station.
- With the unit running, remove the access cover and confirm that the level of liquid in the pumping chamber is below the inlet pipe.
- Confirm operation of the duty pump by waiting for it to start when the float switch becomes vertical, ensuring that all float switches are free to operate, ie, not trapped or covered in sludge.

6 monthly

- **o** As monthly
- **O** Check the condition of the pump(s).
- **O** Switch the power supply OFF at the Control Panel and padlock the mains isolator.
- Remove each pump in turn. Remove the impellor guard. Care-fully remove any accumulations of debris with the assistance of a hose if available / required.
- **O** Replace any damaged components, eg, Impellor, guard etc.
- **O** Check correct operation of the non-return valves on the discharge pipework form each pump.
- Remove any extraneous debris from the chamber normally achieved by tankering away the contents of the pump chamber below the pump stop float level
- Re-assembly is reverse order to the above. On completion, remove the padlock and switch the isolator to the "ON" position checking for the correct operation of the pump station.

Notice: Please ensure to keep the manufacturer's warranty valid, this equipment is required to be regularly serviced and maintained by a competent Service Company. Failure to do so will invalidate the warranty on this equipment.





12

Marsh Industries

Marsh Industries delivers world-class wastewater treatment products and solutions to the domestic, commercial and agricultural sectors from its UK manufacturing plants in Kettering and Bridgwater.

The company is recognised as a collaborative and trusted partner to its customers, with a reputation for providing quality products that really do add value:

- Sewage treatment plants 4-500+ PE
- WellWater™ pump stations 234-20,000+ litres
- Septic tanks and cesspools 2800-100,000+ litres
- Uni:Gem[™] septic conversion units 4-60+ PE
- Marsh GMS grease traps 234-20,000+ litres
- Degrilleur™ trash/debris barrier
- Storm:Dammer™ stormwater attenuation Up to 130,000 litres
- RainCell[™] rainwater harvesting systems 1500-20,000+ litres
- Marator[™] and Hydroil[™] high performance oil separators

All products are fully type-tested and certified to ensure compliance with relevant environmental permitting programmes and building regulations.

In addition, the company's state-of-the art computer software, GAIA, can generate precise, bespoke commercial sewage treatment plants and pump chamber systems to the finest specification.

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