

Developer Services

Design Specification for the Adoption of Small Submersible Foul and Surface Water Pumping Stations

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YorkshireWater

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General

The purpose of this document is to provide developers and designers with a guide to Yorkshire Water's design specification for the adoption of small submersible foul and surface water pumping stations.

This document supplements Part D of Sewers for Adoption (7th Edition) for all pumping stations to be constructed under Section 104 (Water Industry Act 1991) Agreements with Yorkshire Water.

This document comprises Yorkshire Water's design specifications in relation to Part D of Sewers for Adoption (7th Edition) and offers further guidance on Yorkshire Water's requirements for small sewerage pumping stations.

Any design specifications given in this document shall take precedent over Sewers for Adoption (7th Edition).

D1. Scope (SFA 7th Edition)

This Guide is intended to deal with small submersible foul and surface water pumping installations where each electric motor's maximum power is less than 30kW, pumped discharge rate ≤ 100 l/sec and maximum depth from cover level to the underside of the pump unit ≤ 6 metres. The maximum operating speed of the pump units shall not exceed 1500rpm.

The most common type of small pumping installation constructed on housing (and commercial) estates is a wet well containing submersible centrifugal pumps and this is the preferred arrangement for which guidance is given.

Larger pumping installations which fall outside the scope of this document shall be discussed at an early stage with Yorkshire Water Developer Services and could be subject to the Sewer Requisition procedure. Further guidance on this aspect can be obtained by contacting Developer Services and speaking to a member of the Adoptions, Diversions and Requisitions Team who deal with capital schemes.

Framework Suppliers of Electrical and Mechanical Equipment

Yorkshire Water has negotiated with suppliers of electrical and mechanical equipment to ensure that the company obtains equipment of suitable quality and with a guaranteed supply of spare parts. The arrangement is such that all prices are strictly monitored.

This framework provides Yorkshire Water and associated parties with submersible centrifugal pumps for all submersible applications and the provision of spares throughout its duration.

It is preferable that the electrical and mechanical equipment should be procured from the Yorkshire Water Framework Suppliers where these exist. If the developer opts to use non-framework equipment, then that equipment must conform to Yorkshire Water's Engineering Specification V17 – April 2017 and will need to be approved by Yorkshire Water's Electrical and Mechanical Engineers.

Where a pumping station is proposed in Source Protection Zone 1 (SPZ1) or Source Protection Zone 2 (SPZ2), then Developer Services should be consulted at an early stage before any design work is undertaken.

D4: Provision of Pumping Stations

D4.1 Location

1. The minimum distance from the wet well of the pumping station to any habitable buildings should be in accordance with Table D.1, in order to minimise the risk of odour, noise and nuisance. This dimension may be subject to change, depending on the local circumstances and submission of proposals.

Table D.1: Minimum Distances of Wet Wells from Habitable Buildings

Pumping Station Type	Minimum Distance(m)	Location
Type 1	5	Edge of Compound
Type 2	10	Edge of Compound
Type 3	15	Edge of Wet Well

2. The pumping station should not be located where it might be susceptible to flooding at a frequency of more than 1:30 years.

D4.2 Site Access

3. For Type 1 and Type 2 pumping stations, provision should allow access by a 7.5 tonne maintenance / pump recovery vehicle fitted with a hiab to be able to park up and off load a mobile generator adjacent to the kiosk and also a mobile pump adjacent to the wet well. Tanker access is not required.
4. For Type 3 pumping stations, the provision should allow for access by a tanker with sufficient capacity to completely empty the wet well (including any provision for storage above the stop levels) and any resulting upstream in-sewer storage up to a maximum of 18,000 litres (4,000 gallons). A 10.5 metre by 2.5 metre tanker should be able to park on the parking bay within the compound. The swept path of the tanker should

be shown on a drawing and submitted for approval to demonstrate this. A vehicular turning area shall be provided where necessary.

D4.3 Site Layout

The following guidance replaces Part D4.3 of Sewers for Adoption (7th Edition).

1. Surfacing to Compound and Access Road

- a. For all types of pumping station, any access road shall be constructed to highway specification and should be finished level with or be above the adjacent highway and not below. The compound surface should be concrete, and the perimeter edge should be delineated by pre-cast concrete kerb edging.

If the compound is not self-draining, the surface rain water should be trapped by means of a gully and then directed to the foul wet well. For surface water pumping stations, the drain should be directed into the surface water wet well.

The following specifications shall apply:

- The compound construction should be similar to that of the adjacent highway with a concrete surfacing. The Concrete Compound Construction – for trafficked areas, 250mm thick Gen 3 concrete with two layer of A393 mesh. For non-trafficked areas, 150mm thick Gen 3 concrete with one layer of A393 mesh

- b. The top of the wet well and valve chamber covers on all types of pumping station should be finished flush with the compound surfacing. Where the compound involves both foul and surface water pumping stations, the foul wet well and valve chamber covers should be 50mm lower than the surface water wet well, and valve chamber covers. The area between the foul and surface water covers should be gently sloped and not stepped (trip hazards should be designed out).

2. Compound Boundary

The compound should be a minimum of 14 metres long by 10 metres wide for a single pump station and a minimum of 14 metres long and 14 metres wide for a dual pump station.



The compound boundary treatment will depend on its location. It should be designed to fit with the surrounding landscape.

a. Residential Housing – Type 1 and Type 2 Pumping Station

The compound boundary design requirements shall be either a wooden knee-high rail fence or fencing similar to that of the property boundary. Other types of boundary treatment will be considered but will require the prior approval of Yorkshire Water.

b. Residential Housing – Type 3 Pumping Station

Where the site is adjacent to a road and the installation can be clearly seen by passing vehicles, the site is overlooked by residential properties and there is minimal risk of vandalism then no fencing is required. Open compound boundary design shall be discussed with Yorkshire Water prior to construction. The requirements shall include:

- fixed bollards with rounded top which shall be a minimum of 750mm high and be of pre-cast concrete construction. They shall have a minimum planting depth of 450mm and be located at centres not exceeding 1.35 metres;
- the entrance to unfenced compounds, and the ends of access roads, shall have collapsible hinged black powder coating galvanised steel single piece bollards (sized to take a Yorkshire Water padlock) at centres not exceeding 1.35 metres. These shall be a minimum of 80mm square, with a hollow steel section, be a minimum of 1mm high above ground and shall have 450mm below ground encased in a 450mm concrete shoe;
- where abutting gardens, a 225mm brick wall (with piers) shall be provided (between 0.6 metres and 1.8 metres in height) to the side and rear, to blend with the adjacent development and require minimum maintenance. The front shall remain open with padlockable bollards as above, to prevent non Yorkshire Water vehicles parking within the compound;

OR

- where the compound is overlooked by a residential development, round-topped wrought iron fencing or a 225mm thick brick wall (approx. 1 metre high) can be used to mark the boundary. A matching gate with 3.8 metre wide access can be used across the entrance. Alternatively, collapsible galvanised steel bollards across the entrance.

c. Remote / Low Risk Areas – All Types of Pumping Station

The compound boundary design shall be discussed with Yorkshire Water prior to construction. The requirements are either:

- minimum 1.8 metre galvanised steel palisade fencing, and gates shall be to BS 1722-12 type GP18. Pales shall be corrugated W section, triple pointed and splayed. Gates shall be double leaf and have a clear opening of 3.5 metres. All fencing and gates shall be coated green (code 14C39) or a colour that will blend in with the surroundings, or as otherwise agreed with Yorkshire Water; OR
- minimum 1.8 metre high weldmesh steel security fencing and gates.

d. Industrial / Business / High Risk Areas – All Types of Pumping Station

The compound boundary design requirements are either:

- minimum 2.4 metre galvanised steel palisade fencing. Palisade fencing and gates shall be to BS 1722-12 type GP24. Pales shall be corrugated W section, triple pointed and splayed. Gates shall be double leaf and have a clear opening of 3.5 metres. All fencing and gates shall be coated green (code 14C39) or a colour that will blend in with the surroundings, or as otherwise agreed with Yorkshire Water; OR
- minimum 2.4 metre high weldmesh steel security fencing.

3. Last Access Point on Gravity Sewer System

The last access point on the gravity sewer system upstream of the wet well should be within the site compound adjacent to the wet well. This access chamber should also have provision for isolating the incoming flow to the pumping station by means of a hand operated valve or rising spindle penstock. If a T-key is required to operate the penstock then the T-key should be located inside the chamber below the cover on a bracket.

The wet well must have an emptying pipe fitted with a female bauer coupling.

4. Pump Lifting Davits

Pump lifting davits shall be provided adjacent to the wet well for lifting operations and removal of the pump units. The location of the lifting davit socket should allow unhindered use of the davit. The davit shall be lightweight aluminium, be capable of lifting 500kg, and the reach shall not exceed 1200mm. Davits supplied for loads over 500kg or with a reach exceeding 1200mm shall be conventional galvanised steel design.

Both davits and sockets shall have safe working loads indelibly marked on them and test certificates shall be provided.

An additional kiosk is required for secure and safe storage at the pumping station site for the lifting davit.

Standard socket diameter shall be 65mm.

D4.5 Storage

4. For surface water pumping stations, the surface water storage shall be in the upstream sewer system. Peak flows into the station shall be restricted to 0.5-1.0 l/sec less than the proposed pump discharge rate.

D4.6 Hydraulic Design of Pumping Stations

1. The design flow rate of the pump units in foul pumping stations should be at least the maximum of:
 - a. half the peak design flow rate (Clause B.5.1.1 in Sewers for Adoption 7th Edition); and
 - b. the flow rate required to achieve minimum velocity in the rising main.
3. Four level set points should be set in the wet well. These levels should be selected to ensure that:
 - c. the number of starts per hour should be kept to a minimum and the maximum number of starts per hour shall not exceed:
 - for Framework Pumps - no more than 15 starts per hour if approved by Yorkshire Water Framework Suppliers
 - for Non Framework Pumps

Up to 15kW	8 starts per hour
15kW and above	6 starts per hour
 - h. the standby pump unit start level is a minimum of 100mm above the duty pump unit start level and the High Level Alarm level is a minimum 100mm from the standby pump level.

D5: Rising Mains

D5.1 Layout and Marking

3. Minimum depths of cover to the crown of rising mains without protection should be as follows:
 - a. pathways without any possibility of vehicular access – 0.90 metres;
 - b. parking areas with height restrictions to prevent entry by vehicles with a gross vehicle weight in excess of 7.5 tonnes – 0.90 metres;
 - c. parking areas and narrow streets without footways (e.g. mews developments) with limited access for vehicles with a gross vehicle weight in excess of 7.5 tonnes - 0.9 metres.
 - d. agricultural land and public open space - 0.9 metres; and
 - e. other highways and parking areas with unrestricted access to vehicles with a gross vehicle weight in excess of 7.5 tonnes - 1.2 metres.
7. For rising mains, non-degradable marker tape should be laid 300mm above the top of the pipe.

For a non-metal main, the marker tape should incorporate a trace wire brought to the surface at a marker post every 1000 metres (approximately) and connected to terminals on the marker post. At the pumping station, the tape should enter through a sealed duct, 300mm below the finished paved area, and should be terminated with one metre of wire coiled inside the valve chamber. At the discharge end of the rising main, the tape should be terminated inside the discharge manhole and coiled around a brass hook.

D5.2 Reliability

1. The minimum size for a rising main should be 80mm nominal bore for Type 3 pumping stations.

D5.3 Hydraulic Design

3. The rising main should connect at its high point to a discharge manhole before it connects via gravity to the public system.

It is preferred that the rising main is laid constantly rising. Where this is not practicable, air valves are required at high points and wash outs will be required at low points.

5. Where the drainage from a single property is pumped, the rising main should discharge upstream of the demarcation chamber and the lateral drain should be a gravity pipeline.

D6: Design of Pumping Stations

D6.3 Wet Well – General

2. The inlet to the wet well shall be opposite the pump delivery pipe work (where this is not achievable then the angle of the inlet pipe should not exceed 45 degrees from the centre of the pump station), and arranged to avoid turbulence in the well. The invert level of the incoming sewer shall be above the start level of the standby pump. Dependant on the benching arrangement, it may be necessary to backdrop the incoming pipework internally within the well.

Where excessive aeration, or interference with ultrasonic beams from transducers, an inlet baffle shall be installed to manage the flow into the wet well. This baffle shall have a return angle to the wall to further minimise flows dropping on to the pumps.

The angle and height of the inlet pipe shall not direct flows directly on to the pumps or pipework.

3. Benching should be provided to eliminate 'dead zones' in the wet well where siltation would otherwise occur. Benching should start no more than 100mm from the pump unit volute and 50mm from the duck foot bend. The benching shall be 60 degrees. The area under the pump should be as small as possible to ensure effective well cleansing. Flat floor areas should be kept to a minimum. The wet well diameter should be kept to a minimum to reduce the amount of benching required.
6. The wet well should be designed to eliminate the need for man entry for maintenance. No permanent ladder or step irons should be located in the wet well.

D6.4 Wet Well – Structural Design

2. A flotation check shall be carried out on all pumping stations.
3. Precast concrete should conform to BS 5911-4 or BS EN 1917. Joints between precast components should provide equivalent water resistance as specified in BS 8007. The wet well should be surrounded with not less than 200mm thickness of Grade GEN 3 concrete.

D6.5 Valve Chamber

1. The valve chamber should be separate from the wet well to accommodate differential settlement. Valves should not be installed in the wet well.
3. Depending on pumping station type, the valve chamber should house the following:
 - a. for any type of pumping station, one gate valve per pump unit mounted horizontally in the pump unit outlet pipework and arranged to isolate the pump units from the rising main;
 - b. for any type of pumping station, one check valve per pump unit mounted horizontally in the pump unit outlet pipework upstream of the gate valves and arranged to prevent mass flow reversal under normal operating conditions; and
 - c. for Type 2 and Type 3 pumping stations, a gate valve and 100mm diameter female bauer coupling, mounted vertically in a tee piece in the rising main, downstream of the gate and check valves. This should be suitable for connecting to a flexible hose to allow a mobile pump to pump into the rising main during plant maintenance or failure. Where pump flow rates are above 20 l/s then a minimum of 125mm female bauer coupling shall be provided.

Check valves, or non-return valves, shall be mounted horizontally, fitted with a removable top cover, and an external lever weighted arm. The lever weighted arm shall be guarded. One inch BSP tappings shall also be provided and fitted with one inch BSP stainless steel flanged plugs.

4. Where the valve chamber is adjacent to a submersible pump wet well, it shall drain into the wet well via 100mm pipe work, a trapped and

roddable gully (i.e. a 'P trap' gully with a plug) should be placed in the valve chamber to facilitate draining the valve chamber into the wet well. The bottle gully provides a trapped arrangement on the draindown pipe to prevent gases from the wet well entering the valve chamber, unless the wet well is classified as Zone 1 in which case 100mm pipe work with a sealed trap shall be provided.

5. Valves should comply with the specification given in F.4 in Sewers for Adoption (7th Edition), and be fitted with extension spindles up to the underside of the cover and a 'T' key provided for operation. The 'T' key shall be stored inside the storage kiosk.
6. Swept 'T' junctions and long radius bends should be used for pipework. Square 'T' junctions and close radius bends should be avoided to minimise friction headloss.
7. The chamber shall be provided as shallow as possible. However, this shall not be detrimental to the profile of the rising main. The required depth of cover for the rising main must be achieved, (1.2 metres from soffit in trafficked areas, 0.9 metres in non-trafficked areas). The valve chambers opening cover shall extend over the full chamber.

Thrust blocks shall be fitted to the valve chamber pipework on the Tee section and bend (as Figure D.4 in sectional plan in Sewers for Adoption 7th Edition), they shall provide sufficient restraint and cover at least half of the pipework section. Where flange adaptors are fitted, these shall be tied as necessary to resist thrust loadings.

Sufficient room shall be allowed in the valve chamber to facilitate safe access and allow maintenance work to the valves to be carried out insitu. At least 300mm shall be allowed between the pipe work and the walls, with at least 150mm from any flange on outgoing pipe work and the wall.

D6.6 Flow Metering

1. A flow meter provided when duty pump rated at 10kW or more in the valve chamber or in a separate chamber to monitor discharge performance.

2. Any separate flowmeter chamber should be a minimum of 1200mm diameter, located near to the valve chamber. It should include:
 - a. a flowmeter positioned in accordance with the manufacturer's recommendations;
 - b. a rising main isolation valve ('T'-key operated), in accordance with clause F.4.3 in Sewers for Adoption (7th Edition); and
 - c. a 100mm diameter drain to the valve chamber.

D6.7 Access to Wet Well, Valve Chambers and Flowmeter Chambers

2. Openings should have the following features:
 - d. in a closed position, the cover should withstand a 5 tonne static wheel load in accordance with FACTA (Fabrication Access Covers Trade Association) class B loading. Where there is a risk of traffic loading on the cover, the cover should withstand FACTA class C loading (6.5 tonne static wheel load) as a minimum.
3. The wet well should not be vented through the upstream sewer system. Ventilation should be provided in accordance with one of the following methods:
 - a. the installation of a galvanized mild steel vent stack with a minimum diameter of 100mm fitted with a mild steel mesh at the top; where located in a fenced compound the vent stack should terminate at the same height as the boundary fencing or in residential areas the stack can be a minimum of 100mm or up to the height of the fence with a swan neck.
 - b. if secure fencing to site compound is provided, open mesh covering of the wet well may be considered. A site impact on odour complaints, septicity and hazardous area requirements shall be carried out to determine if this option is viable'.

The selection of the method of venting should take into account the risk of odour nuisance.

4. Vent pipes should open at the 'high point(s)' of the wet well. Bends in vent pipes should be large radius; elbow bends should not be used. Vent pipes should be installed in such a way to avoid

them becoming ineffective due to trapped water (rain, condensation, etc.). The external colour of the vent stack should be coated green (code 14c39) to BS4800 unless local planning requirements state otherwise.

5. The wet well should be designed to eliminate the need for man entry for maintenance.
6. Access to below ground valve chambers or flowmeter chambers should be by a galvanised mild steel access retractable ladder.

D6.11 Kiosk Construction

7. Alternative forms of kiosk construction instead of GRP encapsulated marine quality plywood (e.g. steel) may be used in locations subject to vandalism risk (as advised by local police). Approval of the design must be obtained from Yorkshire Water.
8. The doors of the kiosk should be fitted with vandal-proof, stainless steel hinges and self-latching stays to restrain the doors to a minimum opening angle of 90 degrees and a maximum of 110 degrees. One door should have stainless steel shoot bolts at the top and bottom.
14. Doors on kiosks shall be fitted with a hasp and staple locking mechanism with triangular bit locks at the top and bottom to maintain the IP rating and to lock the doors to the frame. The hasp and staple shall be suitably sized to take a Yorkshire Water abloy padlock.

D6.12 Kiosk Mounting Arrangements

1. The kiosk should be mounted on a 200mm GEN 3 concrete plinth, 150mm above the finished surface level or the wet well cover slab level on a 150mm Type 1 stone sub base. The plinth should extend a minimum of 125mm beyond the kiosk walls and have 20mm chamfered edges. The area to the front of the plinth shall gently slope away from the kiosk to allow surface water to run off.



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