Local practices to support Code for Adoption Sewerage

Pumping stations

A note on Code for Adoption Sewerage

Under Section 104 of the Water Industry Act and Sector Guidance Clause 2.6, we can define two local practices that deviate from Ofwat's Code for Adoption Design and Construction Guidance (DCG).

These specify the additional requirements that you'll need to meet before we adopt new sewerage assets.

You'll need to consider our local practices if:

- You require easements for surface water discharge to watercourses, bodies of water, sewers within third-party land, or sewers that may form part of another feature
- You require a pumping station adoption on your site

To comply with the local practice rules within the Code, we're always required to consult with customers like you (both directly and via our website) to outline our local practice proposals.

We consulted on this local practice covering pumping station designs during January 2020, and we received several comments and challenges.

We've published these in a summary, and where appropriate, we've amended our draft local practice to provide greater clarification.

Please read on to discover more.

Local practice for pumping stations

1. Introduction

From choosing the right Mechanical and Electrical (M&E) components to managing Health and Safety risks, designing pumping stations is a complex process.

With an ever-expanding asset portfolio of pumping stations for us to maintain, managing events in real-time is a continuous challenge. That's why we need to synergise planning and programming maintenance, keep up-to-date asset data on every piece of equipment, and maintain remote visibility of performance for when things break down.

We need a local practice for pumping stations to make sure newly adopted assets:

- are built to appropriate industry standards
- will fit as seamlessly as possible into our maintenance plans
- can help us to plan and safely manage events or system failures
- limit the potential impact of sewage flows arriving at a faulty pumping station, which can result in flooding and pollution incidents

Please read this document alongside the Design and Construction Guidance published by WaterUK as part of Ofwat's Code for Adoption Sewerage.

2. When you need a pumping station

If you're laying new sewers that gravitate to a low point, we recommend you investigate all possible options to avoid pumping flows. You could use off-site sewers, potentially requisitioned from us, to save on the whole-life costs of a pumping station.

Any new pumping station must comply with the current Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) and provide suitable access for a tanker that needs to carry out maintenance or respond to an emergency.

3. Minimum submission requirements

To help us process your application for the adoption of a new pumping station, we've created a minimum information list. This includes all the documents you need to send for us to accurately assess your proposed design. If you don't send us this information, it could delay or hinder your application.

4. Technical guidance and design specifications

In addition to the general design principles and layout arrangements in the DCG, we have specific requirements for the following technical areas:

- DSEAR compliance (zoning application and venting risks)
- Tanker access (vehicle size, length and capacity)
- Rising main size and material
- Macerator pumps
- Chemical dosing
- Access covers to wells and valve chambers (location, size, type and vandalism risk)
- Fencing (material, type and height)
- Flow monitoring point
- Lifting davit and gantry (size and loadings)
- Operational and maintenance manuals (O&M)
- Variable speed drives
- Pump lifting requirements
- Control panel buttons and indicators
- Provision of generator connection
- Telemetry and ultrasonics

We've set out the design specifications below. We intend these to substitute or add to the section 'Type D Pumping Stations' in the DCG, and we've added the relative clauses for clarity. Please read these alongside the DCG.

4.1 General rules

Connecting to the network

If you're planning a new pumping station that will connect to the network within 100m of our existing sewage treatment works, our day-to-day operations may be affected. We'll need to assess this carefully and consider alternative discharge points.

Table D1 Minimum distances from habitable buildings

Measure the distance from the nearest part of a habitable building to the nearest point of the pumping station compound boundary/fence.

Pumping station type	*Minimum distance*
Type 1	10
Type 2	15
Type 3	20

For multi-phased developments, we can't formally vest the pumping station until the new development's occupancy has reached more than 51% for all connected phases.

Network emergency storage

The wet well and associated storage (outside or inside the gravity network) must provide a minimum of four hours' storage in case the pumping station fails.

Chemical dosing

We prefer to avoid permanent chemical dosing. This suggests insufficient cycle times, leading to sewage sitting within the well for too long, operational issues and unnecessary opex costs. Please consider changing the location of the station or the length and size of its main.

D5.2 Site access by tanker

We prefer to access a pumping station directly off a public highway. If this isn't possible, we'll consider access via private roads with several conditions.

If the only access to the station is via a privately-owned road, track or access route, you'll need a legal Deed of Easement document. This confirms that:

- our access won't be hindered in any way
- the owner must maintain the access route at his expense for as long as the station is operational
- we won't be charged any fees for accessing or maintaining this road
- the private access road must be able to safely accommodate our designated tanker

We won't consider tanker access if it needs to cross a bridge that isn't part of the public highway or owned by the Highway Authority.

Access is required 24 hours a day, 365 days a year. The right to remove trees and other obstructions will be clearly set out in the easement. The owner should always approach us early in the adoptions process if they need an easement over private land.

Our maintenance vehicles and road tankers must not need special permissions, permits, temporary signals or prior parking restrictions to access the land. They also won't be able to give any notice to landowners.

You'll need to provide appropriate visibility splays at junctions / bends for safe access.

Please make sure our parking spaces don't straddle and/or restrict any public or private right of way. Design these appropriately so that there's access to the relevant areas at all times.

For Type 1 and Type 2 pumping stations

Make provisions to allow access for an 18,000L tanker. If this isn't possible, make sure a maintenance/pump recovery vehicle (fitted with a Hiab) can park up and offload a mobile generator adjacent to the kiosk and a mobile pump adjacent to the wet well.

For Type 3 pumping stations

Make provisions to allow access for 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 22,000 litres.

For all pumping stations

Please make sure parking for a second operational vehicle is available within or immediately adjacent to the pumping station compound without the need for traffic management or parking bay suspensions.

Design site access from the nearest public highway in accordance with HSG136. Avoid the need for reversing and make sure to follow these guidelines:

1. Vehicles should be able to enter the site facing forward, navigate the site by means of a designated one-way 'traffic route', and leave the site facing forward. If this isn't possible…
2. Vehicles should be able to enter the site facing forward, navigate the site by means of a designated 'traffic route', and turn at either a 'banjo' or 'hammerhead' designed for vehicle manoeuvring. If this isn't possible…
3. Vehicles should be able to enter and exit the site via different gates to remove the need for turning on-site.

In some situations, vehicles may be able reverse into the compound without special traffic management requirements or a banksman and then drive forwards out of the compound. We'll consider this option on a case-by-case basis.

Fencing and security

All Type 2 and 3 pumping stations should have 1.8m high steel palisade fencing, painted green.

Fencing must prevent unauthorised access to the works. If there's evidence to suggest it's not effective, you'll need to upgrade it. The designer of the works should assess the risks and suggest the appropriate security equipment. If you're planning to erect new fencing or brick walls, you'll need to consider the location, exposure, ground conditions, and site history for each site.

Any equipment you're storing on site must be tamperproof. This means you'll need tools or keys to open or uncover equipment that could be dangerous to trespassers.

In high-risk areas, you may need to use higher security-graded fencing, such as galvanized steel welded mesh. If planning or heritage authorities demand it, you can use any durable and effective material to prevent access, such as local stone walls, clay bricks, flint etc.

Please keep fencing free of vegetation and debris.

All pumping station kiosks must also have intruder alarms. When kiosks are located within the public domain (eg in unfenced pumping station compounds), please discuss this with us. We may need you to fit additional vandal-proofing/anti-theft devices such as audible alarms or visible signals.

If a kiosk needs an increased security level, it must meet the requirements of LPCB 1175 SR 1, 2, 3, 4, 5 etc. LPCB standards are listed within the relevant elements of the Red Book.

D5.3 Access chambers

Please don't build access chambers to wet wells and valves in highways, as they may be repeatedly driven or parked on. They should always be located in areas away from traffic.

The top of the wet well and valve chamber covers on all types of pumping station should be finished flush with the compound surfacing (trip hazards should be designed out).

Use galvanised steel covers designed for a minimum uniformly distributed load of 5kN/m2 for both the wet well and valve chamber. The covers should be hinged and capable of being locked in the closed position to prevent unauthorised access.

If covers do not hinge through 180°, you should be able to secure them in an open position to form a partial barrier around the opening.

All electrical, valve chamber, monitoring and wet well covers must be flush-fit, hot-dipped, galvanised and manufactured to LPS 1175: Security Rating 3 at a minimum. Please fit safety stays to prevent falls as well as hidden hinges and turn-catch locks with hidden padlocks to prevent intruders (we can recommend suppliers if you need them).

D6 Rising mains

If you're providing rising mains, polyethylene PE100 SDR11 is our preferred rising material and class.

The minimum rising main size of 80mm bore stated in D5.2 (1) is limited to locations where all the following conditions apply:

- The station serves a catchment where both foul and surface water public sewerage will exist, serving all the properties contributing to the pumping station (these catchments have a low risk of becoming combined sewers due to unpredicted surface water connections)
- The upstream catchment is topographically limited, reducing the feasibility for further development (this prevents the risk of reasonably foreseeable growth overwhelming the pumping station)
- There are no other pumping stations feeding or planned to feed into the catchment of the pumping station (so they won't pump more into the rising main than can practicably be conveyed out)
- The main is reasonably straight between potential access points (so a CCTV camera can pass along it)
- The access points (hatch boxes, air valves, washouts and ends) are no more than 100m apart (so the camera has traction or can be pushed on rods)

Rising mains and macerator pumps

We won't adopt pumping stations that use macerator pumps.

Rising main flow monitoring and pressure monitoring tapping in the valve chamber

Please provide a 25mm tapped boss, plugged, on the crown of the riser pipe of each pump in the valve chamber. This should sit upstream of the isolation valve of each pump riser so that pressure monitoring equipment can be installed in the future.

Please install a full bore electromagnetic flow meter so that rising main flows can be measured easily. This should be located on the rising main and not on each pump set.

The flow meter must be suitable for the environment you're installing it in, and therefore must be suitably rated. Please panel-mount the meter transmitter with local display or within the kiosk.

D7.2 & D7.3 Hazardous areas and wet wells

Any hazardous areas, wet wells or associated sewers that receive domestic and/or surface water shall be classified as zone 2. The equipment shall have a minimum requirement to meet the ATEX directive 2014/24/EU Equipment Group II Equipment Category 3 with a temperature class of T3.

We'll assess valve chambers as Zone 2 in accordance with the above. If required, we can provide some standard zoning plans to help you.

D7.6 Incoming gravity sewer flow monitoring

Please install any required penstocks to manufacturer's guidelines (eg installed within flat-faced chambers).

We recommend you use M150 penstocks that comply with WIMES 8.10. These should preferably be on seating and located on the outgoing pipe in the inlet manhole.

D7.9 & Fig. D1 Lifting

We've standardised and load-tested our preference is a Reid ADV500 davit for lifting up to 350kg at a 800-1300mm radius, with one or two sockets as appropriate, 65mm dia and 240mm deep. The sockets will be cast in, bolted or otherwise securely fixed. The davit must be cast flush into the cover slab. For lifting over 350kg, please provide a fixed gantry – if this creates planning issues, we may consider a portable gantry stored on site. For depths greater than five metres and weights over 0.5 tonnes, you will need to provide a power lifting system.

You'll need proof load test certificates for all lifting types, including a site test for sockets. All davits or jibs must be labelled with their certified safe working loads.

We'll provide a jib with separate attachments for the hoist as well as holding chain and hook arrangement. This should help you to lift pumps that have intermediate or snatch and grab rings.

Please make sure the standard of design is safe for the operator, meaning no sharp edges, slots, gaps, holes or any other configuration that could injure them.

We recommend you manufacture a design from a continuous shaft or pipe that gives a smooth, clean and professional appearance.

Fit a cover plate to each davit socket to prevent dirt and water from entering it when you're not using it.

Use stainless steel anchors to secure the davit sockets and a sealant to prevent water from entering the gap between anchor and socket, which could freeze in cold temperatures and damage the sockets.

Design overhead runway beams and gantries to the relevant standards: BS 2853, BS 449, ISO 4301/1 (BS 2573), and ISO 4301/1 (BS 466).

All equipment should be rated to support 1.5 times the weight of the load it will handle. Lifting gantries should be supported with correctly designed gantry bases and not by the walls of any building structure.

Use effective end stops on the runway to prevent the trolley falling from the beam or damaging the structure of the building. These shouldn't operate on the flanges of the trolley wheels.

Don't forget to clearly mark all individual items with their respective safe working loads. You'll also need test certificates for the structure, hoist block and trolley.

Cabinets and kiosks

Cabinets and kiosks are often exposed to extreme weather conditions in a damp and corrosive environment. They must be able to withstand these conditions for at least 20 years and incorporate UV inhibition during the manufacturing process.

Cabinets and kiosks must provide a dry, temperate, clean and dust-free environment to store equipment. Please design them to be:

- Weather-proof
- Corrosion-proof
- Vandal-proof
- Vermin-proof
- Maintenance-free
- Fire-resistant
- Thermally insulated to minimise solar heat gain
- Cooling to accommodate solar gain and power losses from internal electrical apparatus

Doors should open outwards using a mechanism designed to withstand high wind speeds. Please construct them out of the same material as the enclosure and fit them with vandal-proof and self-latching stays to keep the doors fully open.

Protect gaps around and between doors internally while leaving enough space to close the doors easily.

All doors should be dust and weather-proof to meet IP 54 with a half-hour fire resistance to meet BS476 Part 22. Double doors shouldn't have a central pillar.

As specified on the DATASHEET, cabinets need to open with a single or double door that locks with a cylinder night latch. The three-point locking system should use triangular locks at the top and bottom and either a central cylinder lock or a hasp and staple with a suitable padlock. You shouldn't fit handles on these doors.

Please let us know if you're building in area with a high risk of vandalism so that we can tailor our security advice to you.

D7.7 Air vents part 3b

Cables to and from and kiosks and equipment should pass through a vented cable draw pit. This pit must have a drain down pipe to the wet well.

We recommend you use an air vent, such as a low-level vent with an ironwork grated cowl and an internal carbon filter, to prevent vermin, debris build-up, blockages and accidental damage.

D7.12 Plinths

Please incorporate a back-to-front cross fall of 1:250 on your plinth to prevent ponding.

F1.1 ATEX certification part 3

For any equipment installed in or associated with a hazardous area, please include ATEX certification in the O&M manual.

F1.2 O&M manuals

Please provide three hard copies and one electronic copy of your O&M manual.

F2.2 Performance requirements

The pumps shall be capable of operation at snore level every 6 to 8 hours for at least 30 seconds without damage.

F2.3.10 Motors driven by variable speed drive

Where the motor is to be driven by a variable speed drive, it shall be de-rated so that its temperature rise is within Class B limits at its lowest operating speed corresponding to minimum flow rate. It shall not exceed Class B temperature limits when operated at any speed in a dry well or when partially submerged configuration.

F2.3.1. Information plate part 1

Please mark pump unit equipment with the relevant ATEX certification following the ATEX Equipment Directive (ATEX 95).

F3.2.1 Introduction part 1

If you're proposing soft start units, please provide evidence to justify their selection before you install them. This should include your technical solution to limit the harmonics and satisfy G5/3 requirements.

We can only approve soft stop systems if you've justified why you need them and why you've chosen them before you start installing them. We'll need to take into account the potential additional demand on the electricity supply.

F3.2.2.3 Safety signs part 2e

The sign should state "Contains intrinsically safe equipment".

F3.2.2.3 Safety signs part 3

All safety signs shall be rigid plastic. Self-adhesive vinyl will not be acceptable.

F3.3.3.3 Installation and layout of components part 1

Please consider the need for circuit segregation when laying out intrinsically safe barriers with outgoing cables/wiring, complying with BS EN 60079-11.

F3.3.3.4 Doors part 3

Each door should have at least one lockable handle. All assembly/panel locks should open with the same key.

F2.2.5.4.2. Layout and identification of terminals part 3

Instead of stud type terminals, please mount terminal blocks on a back rail and locate these in the cubicle/compartment relating to the equipment (eg pump 1 terminals should be inside the Form 4 compartment for a pump 1 starter). We can't approve common terminal cubicles.

F3.3.6 Indication lamps, push buttons and selector switches part 4

Please use coloured push buttons as follows:

- RESET – Blue
- OPEN or STOP or EMERGENCY STOP – Red
- CLOSE or START – Green
- ALARM ACCEPT – Yellow
- OTHERS – Blue

Use indicators suitable for 110V supply and incorporate high-intensity LEDs for an extended lamp life. These should have a front removable lamp with a degree of protection to IP2X as well as coloured lenses.

- AVAILABLE – White
- TRIPPED – Yellow
- SUPPLY ON or CLOSED or RUNNING – White

- SUPPLY OFF or Opened or STOPPED – Green
- DANGER – Red
- OTHER - Blue

F3.3.8 Failure of the pumping station power supply part 2

To stagger pump restart, you must use hard-wired timers in each pump cubicle (if required).

F3.3.8.2 Motor earth fault protection

This could be excessive for small pumps.

F3.3.8.4 Back-up control mode part 2

In back-up control mode, if pump 1 is unavailable or has failed, then pump 2 shall start and run instead. The control system shall automatically revert to pump control via the ULC when the back-up control timer has timed out; if the level reaches the back-up control high level again, the back-up control shall be instigated again.

F3.3.8.4 Back-up control mode part 3

In hazardous areas, please use a galvanic type intrinsically safe barrier for the back-up control circuit.

The back-up settings should mirror the standard pump regime operation for the site's pumps.

F3.3.8.5 High wet well level

In hazardous areas, please use a zener type barrier that can trigger the high wet well level circuit's alarm even with the power off. During normal operation, the high float should use the normally closed contact of the float with an open circuit state to trigger the alarm.

Motor stator temperature

You may need this as part of the ATEX certification for the pump unit.

F3.3.10.1 ULC display

The display for the ULC should be visible on the outside of the electrical panel. You shouldn't need access to the inside of any electrical panel or cubicle to view it.

F3.3.11.4 Motor starter compartments part 4

Please use remote reset type overloads.

F3.3.11.5 Common control compartment part 2

Please use a zener barrier for the high float and a galvanic-type barrier for the back-up control float circuit.

F3.3.11.5 Common control compartment part 6

Make sure to segregate IS and non-IS circuits to comply with BS EN 60079-11 and 14.

F3.3.11.6 Cable marshalling compartment cable-way part 1

Make sure to segregate IS and non-IS circuits to comply with BS EN 60079-11 and 14. Alternatively, IS circuits can exit the electrical assembly at a different point to maintain segregation.

F3.3.12.3 Incomer part 2

At a minimum, the incomer must incorporate the following equipment and facilities:

a) A 4-pole (3-phase and switched neutral) fuse switch with three suitably rated HRC fuses, labelled 'Mains / Off / Generator'

b) A phase failure, phase reversal and low voltage protection relay to prove a 'Mains Failure' telemetry signal, with the phase failure detection relay connected downstream of the 'Mains / Off / Generator' switch

c) a set of fuses and a neutral link for the phase failure relay and voltmeter, as outlined in the existing Code for Adoption

F3.3.12.6 Common control compartment part 2

Please use a zener barrier for the high float and a galvanic-type barrier for the back-up control float circuit.

F3.3.12.6 Common control compartment part 6

Make sure to segregate IS and non-IS circuits to comply with BS EN 60079-11 and 14.

F3.4.1.5 Junction boxes part 7

Please design these carefully to make sure you've segregated IS and non-IS circuits to meet BS EN 60079-11 and 14.

F3.4.4 Installation of cables part 2

Please make sure cable pits meet WIMES standards. They should be located at least 2m away from wet wells and open away from well chambers.

Install cable support socks on Type 3 pump stations and hang pump cables from the same hook as the pump lift chain.

Make sure 4A cable ties are made from plastic-coated metal.

F3.4.4 Installation of cables part 5

If your site's wet well is zoned, the ultrasonic level sensor and float cables can only share a duct if:

- the ultrasonic level sensor is of an intrinsically safe type
- all cables in the duct are on intrinsically safe circuits

If you're using a non-IS ultrasonic level sensor, the ultrasonic cable should run in a separate duct.

F3.4.4 Installation of cables part 12

Please seal ducts at the kiosk end and not in the wet well. Use a gas-tight certified sealant system such as RISE or FILOFOAM.

F3.4.6.1 Earthing and bonding part 5

Connect the generator socket earth pin shall and the local earth rod to the panel's main earth.

Provide an earth link to disconnect the pane's main earth from the DNO's main earth terminal.

Make sure all terminals, links and cabling are adequately sized and rated to withstand the short circuit current. You must also properly and securely mount and protect them.

F3.4.6.2.2 Earth electrode part 7

To meet the requirements of BS EN 7671, your earth electrode should provide the maximum effective earth resistance needed to switch on the protection in the necessary disconnection time.

F3.5.2 Installation of instrumentation part 3

All back-up float switches must be accessible from outside of the wet well without a tool and with any fall restraint system in place. Covers should be open and man trap/safety grids in place with floats positioned to be accessible from ground level.