

Sewers for Adoption 6th Edition Pumping Station Addendum

June 2014

Update Log: *Latest updates shown in red text*

Version Nr	Date	Comments
v1.6	17 Jun 2014	Sec 2.21.1.a - Depth of rising main in valve chamber to be 1.2m to soffit added
v1.5	05 Aug 2012	Part 3A – Sec 3.3.16.1 updated
v1.4	16 Dec 2011	Updated document - Dec2011 version (Version number - under 'Revision' column changed on 16/12/2011 - previously known as "Dec 2011 Version")
v1.3	12 Oct 2010	Updated document - Aug2010 version (Version number - under 'Revision' column changed on 11/11/2011 - previously known as "Aug 2010 Version")
v1.2	11 Dec 2009	Document moved from SC stds DB. Updated to Dec 08 version (Version number - under 'Revision' column changed on 11/11/2011 - previously known as "Dec 08 Version")
v1.1	27 Mar 2008	Updated document from WRc Website (Version number - under 'Revision' column changed on 11/11/2011 - previously known as "Jan 08 Version")
v1.0	15 May 2007	New document (Version number - under 'Revision' column changed on 11/11/2011 - previously known as "Oct 06 Version")

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PART 2B - PUMPING STATIONS

2.17 GENERAL DESIGN OF PUMPING STATIONS

2.17.1 When designing the gravity foul sewer network the developer should note that the preferred maximum depth of the wet well, from ground cover level to the underside of the pumpset is 7 m. For depths exceeding this then an auxiliary suction pipe may be needed.

2.17.10 Special consideration should be given to the design of terminal pumping stations delivering directly to a treatment works or where the discharge point is close enough to the works for there to be no attenuation in the gravity sewer upstream of the works. Developers are advised to open discussions with the Undertaker as early as possible.

2.17.12 STW standard pumping station template drawings are available from Severn Trent Water.

2.17.13 SPECIFIC GUIDANCE FOR ADOPTABLE SW PUMPING STATIONS

2.17.13.a Pumping stations must be fail safe in operation in the event of pump or plant failure. A generator connection shall be provided.

2.17.13.b The SPS must be capable of pumping the entire storm and be provided with stand by pumps and control panels or be capable of storing the entire storm in the event of pump or plant failure.

2.17.13.c Since the impact of any resultant flooding is greater, then for critical sites, the proposed adoptable gravity surface water sewers discharging to the station may have to be designed for the 1:5 year storm event.

2.17.13.d The system must not flood in the 1:30 year event. In exceptional circumstances provision of storage for the 1:100 year event may be considered for adoption. However this is not preferred by Severn Trent Water (STW). The effectiveness of proposed flood routing must be demonstrated to the satisfaction of STW.

2.17.13.e The Sewage Pumping Station (SPS) may have to be provided with a pump which can accommodate low flows from light rainfall as well as pumps needed to cope with flows from the critical storm event.

2.17.13.f In some instances provision of adequate raked coarse screens and grit separators.

2.17.13.g For large SPS with high discharge rates it may be necessary to prove performance of their proposed design by undertaking scaled hydraulic modelling of the SPS wet well and pump configuration by a specialist consultant in this work.

2.17.13.h Land drainage must not directly or indirectly connect to the proposed adoptable surface water sewer network and be provided with sufficient flood protection to prevent it entering into it in an extreme event.

2.18 **LAYOUT OF PUMPING STATIONS**

2.18.1 Pumping Station layout. To accommodate use of rigid body 4,000 gallon tankers the preferred minimum size of compound needed is 14m x 11.35m with 4m wide gates. Where the compound has an integral turning head then size needed is 29.5m x 17.5 m

2.18.2 Fencing: Subject to local planning approval, Severn Trent Water standard requirement is for sites to be enclosed with 1.8 m high expanded metal panel fencing or alternatively an equivalent brick wall with gates secured by padlocked slide bolt or similar. Gates should provide the same degree of protection as the adjacent fencing. Where the above requirement cannot be met either in order to satisfy specific local planning approval or other environmental and amenity considerations selection of suitable perimeter fencing for the site will be based upon a risk assessment. Details are available from Severn Trent Water.

2.18.5 Access from public highway. To aid safe and reasonable vehicular access to pumping stations there are preferred layouts with minimum dimensions for the following situations.

- Pumping station off road with integral turning head – Layout A
 - Pumping station compound off road – Layout B
- Details are available from Severn Trent Water

2.18.6.a Access Roads Where a new dedicated access road is being constructed then our preference is that the road is owned by Severn Trent. The access road shall conform to the necessary requirements of the Highway and Planning Authorities

2.18.6.b The minimum layout requirements for a site which will be served by large rigid and articulated vehicles are as follows:-
Road Width on straight single track roads is 4.0 m. Internal radius of bends is 10.5 m

2.18.6.c Gradients and cross falls should be provided within the following ranges:-

Maximum road gradient is 1 in 15

Maximum cross fall is 1 in 30

Optimum cross fall is 1 in 40

Minimum cross fall is 1 in 50 (or 1 in 60 for concrete roads)

Maximum gradient within 15 m of highway is 1 in 30 (to be agreed with Highway Authority)

2.18.6.d Gates – should not open on to the highway. If the approach is straight then the gates should be 4.0 m wide minimum. For openings over 4.0m wide double gates must be provided

2.18.6.e Concrete roads – In all cases Grade PAV2 air entrained concrete shall be used to provide adequate frost resistance. It is essential that the concrete mix does NOT contain PFA.

2.19 **EMERGENCY OVERFLOW**

Emergency overflows are not required on new foul water pumping stations.

2.20 **WET WELL**

2.20.1.a Flotation – The minimum factor of safety against flotation for empty structures subject to groundwater pressure is 1.1 as outlined in BS8007:1987. This should only be used where the maximum groundwater level can be assessed accurately or a design groundwater level at finished ground level is being used.

2.20.1.b In situ reinforced concrete – the minimum cover should not be less than 40 mm provided this meets the requirements of BS8500 -1:2006 and BRE SD1. All concrete water retaining/excluding structures shall be designed to satisfy cracking requirements for flexural and thermal loading. The standard concrete mix based upon BS8500 is C28/35 – general water retaining (and water excluding) structural applications. Reinforcement shall be designation H high yield steel with a design stress of 500 N/mm².

2.20.2 A stainless steel baffle plate must be provided with a nylon rope, used to lift the baffle plate to clear any material trapped between the plate and inlet pipe, looped through the baffle plate and attached to a stainless steel parking bracket self anchored to the concrete edge of the clear opening.

2.20.4 The hazardous (potentially explosive atmosphere) Zone classification of wet wells to pumping stations shall be determined by means of a non calculable approach used to better understand the likelihood of a Potentially Explosive Atmosphere forming from the entry into sewers of flammable substances stored and used within the catchment. It is known as Catchment Area Analysis (CAA) assessment. Buildings and kiosks containing electrical equipment shall be isolated from chambers falling into any Zone classification. The equipment in them should be designed to comply with their Zone classification. The CAA assessment should be undertaken prior to the design stage to determine whether explosive proof equipment is required. The CAA is used to determine if a catchment is Normal or Higher Risk.

Where no existing flow is routed through the new development and there will be no significant volumes of flammable substances stored in that development then the presumption is that the CAA will give a Normal Risk classification. In this instance the hazardous zone is designated as

ST-Zone BZ. This is the name used to describe the minimum non statutory design standard applied to sewerage assets. The standard determines a minimum standard for equipment installed into areas that are exposed to a sewage derived atmosphere that has a likelihood of forming a PEA which is less than the statutory Zone 2.

If the existing sewage flow is to be diverted through the new development site then the developer must consult with Sewerage Asset Protection who will then undertake the CAA assessment in order to determine whether the catchment risk is Higher or Normal and thus designate the hazardous zone classification.

2.20.5 If a separate storage/inlet chamber is provided upstream of the wet well then it must be located in the compound and in an area where safe access for maintenance can be provided. The chamber shall be provided with a penstock and fixed tank emptying suction pipe of 100 mm diameter set 500 mm above the invert of the chamber and rising 900mm above ground level to the centre line of this suction pipe. It needs to terminate with a 90degree bend and a male Bauer coupling.. The penstock must have an extension spindle capable of being operated at ground level If a larger wet well is used instead of an inlet chamber the penstock should be located in the wet well.

2.21 VALVE CHAMBER

2.21.1 Wherever possible the depth of the valve chamber from ground level to floor of the chamber should not exceed 1.5m. The minimum depth should not be less than 0.95m

2.21.1.a The maximum depth of the rising main in the valve chamber should not exceed 1.2m to the soffit of the pipe

2.21.2.c The female Bauer coupling over pumping pipe to terminate with a 90 degree horizontal bend , 900 mm above the valve chamber cover to centre line of the over pumping

2.21.3 STW preference is that the discharge from the drain is by a penstock. A flap valve in the well is not acceptable.

2.21A FLOW METER CHAMBER

2.21A.1 The chamber shall be a minimum of 1200 mm diameter, located near to the valve chamber. It shall include

- A flowmeter positioned in accordance with the manufacturer's recommendations
- A rising main isolation valve (T-key operated)
- A 100 mm diameter drain to the valve chamber

On secure compounds the cover to comprise bolted down open grid flooring.

2.22 ACCESS INTO WET WELL AND CHAMBERS

- 2.22.1** STW preference is that open mesh decking be utilised over the whole chamber. Maximum loading to be 500kg/m. Mesh decking to be provided with holes or slots to allow operation of valves from ground level. Standard details for mesh decking flooring are available from Severn Trent Water.
- 2.22.2** Extension spindles and handwheels shall be fitted where appropriate to facilitate operation of the valves in the event of the valve chamber being flooded.
- 2.22.3d** Cover and frame to wet well, if subject to traffic loading from maintenance vehicles, be FACTA Class C loading
- 2.22.3e** The safety grid to be provided with a 225 mm dia slot to allow suction hose to pass through
- 2.22.5** A vertical stainless steel ladder shall be provided for man entry into the wet well. It is to be located, centrally, opposite the pump guide rails with the top of the ladder fixed to the concrete edge of the clear opening to the well. Retractable handposts are to be provided either side of the ladder, self anchor bolted to the concrete edge of the clear opening.

PART 3 - M & E SPECIFICATION FOR PUMPING STATIONS

Severn Trent Water Ltd has set up Framework Agreement purchasing arrangements for the supply of products and services for pump/motor sets and motor control panels. The Company now procures its M & E equipment from these Framework suppliers.

It may be advantageous for Developers to procure their M & E equipment from these same Framework suppliers since they will have the comfort of knowing that the products are of an acceptable quality and will be able to take advantage of discounted prices that may apply.

It should be noted that there is no obligation on Developers to use Severn Trent Water Ltd Framework Agreements suppliers. However, should the use of such Framework Agreements prove attractive, then the current list of the relevant Framework agreement suppliers can be obtained from Severn Trent Water.

PART 3A – PUMP SPECIFICATION

3.1.1. To prevent retention in standby pipe work pump starts will alternate the pump duty.

3.2.3 The control of the scour cycle will allow for adjustment in frequency so that the scour frequency can be optimised.

3.3.8.2 Severn Trent Water requirement is for no moisture to enter the motor housing during the life of the bearing (see 3.3.9.2)

3.3.11.1 Severn Trent Water requirement is option (b) a hydraulically-actuated flushing valve fitted to one of the pumpsets

3.3.13.1 Lifting Operations (Davit Assembly)

For pumps up to 334kg gross weight a 500kg davit system must be supplied, this allows a safety factor of 50% to allow for lifting accessories / pump chains / breaking out forces / ragging, fat and grit deposition.

Davit sockets installed may be grouted / surface or wall mounted and should be of galvanised finish. 500kg davit installations must be able to support a standard 65mm pinned davit assembly and have the ability to incorporate a load cell as part of the lifting operation.

Note :- For pump installations above the 334 kg Gross weight limit lifting options / practices must be done through consultation with Severn Trent Water at the design stage.

3.3.15.2 A lifting gantry will be required for lifting pumps heavier than 334 kg. At design stage provision should be made to ensure there is sufficient clearance between the cover slab and the bottom of the pump when lifting the pump out using a load cell and chain block or electric winch.

3.3.16.1 Where the wet well is greater than 7.5 m in depth or the load is more than 500 kg then fixed stainless steel lifting chains shall be supplied and will be short link welded and manufactured from Grade 50, AISI 316 Stainless Steel to BS EN 818 (DIN766)

The lifting shackle attached to the pump must incorporate an extended pin and nylock nut to prevent loosening as a result of vibration. Otherwise Severn Trent Water's Lifting Location System (LLS) should be used.

The LLS comprises of:-

- A stainless steel pvc coated wire guide rope terminated at both ends with a steel carbine hook with screw gate, secured with a crimped cooper ferrule.

Attached to:-

- Two stainless steel eye bolts fixed in an easily accessible position at the top of the wet well and spaced apart such that the wire rope forms a V shape with the load. When in use the guide rope is used to locate a specially designed hook directly onto the load

3.4.1 The additional motor protection as required by this clause shall apply to pump sets rated at 13.5 kW and above.

PART 3B – MOTOR SPECIFICATION

3.7.4.1 To ensure air changes in the wet well and prevent retention under normal operating conditions there will be at least one pump start in a 24 hour period.

3.8.3.4 For secure sites each pumpset cable shall be connected to its associated control panel cable by means of an above ground, free standing junction box on lockable galvanised steel uprights, adjacent to the wet well at a nominal height of 1m, fitted with barriers for segregating cables with different operating voltages. For non secure sites then cabling shall be provided via ducts direct to the kiosk. The distance between the panel and the wet well is expected to be less than 5 metres.

PART 3C – ELECTRICAL SPECIFICATION

3.9 SCOPE

3.9.1.h an electromagnetic flowmeter

3.10.1.7 Severn Trent Water will only accept registered contractors.

3.10.1.10 The earthing, ducting and certification process for panels and electrical installations shall comply with STW standard ME37 and the various DSEAR associated electrical model approaches contained within the STW Design Manual.

DSEAR requirements – prior to commissioning and handover of the pumping station to STW the following STW DSEAR requirements must be complied with:-

Where hazardous zone is classified as ST-Zone BZ - a certificate of installation and the earth bonding certificate must be submitted to Asset Adoptions. Blank copies of these certificates for use by the developer/his contractor can be obtained from the Asset Adoptions offices.

For the other statutory hazardous zones please contact Severn Trent Water.

For a sewage pumping station designated as ST –Zone BZ only low risk equipment shall be used. Examples are float switches, submersible pumps, ultrasonic level detectors and proximity switches. The equipment shall be non-sparking.

Equipment requirements for ST-Zone BZ are based upon the concept of low risk equipment in that:-

1. For electrical equipment, this shall only include equipment, which under normal operating conditions, does not increase its surface temperature, does not have opening or closing contacts or does not have exposed conductors with minimal risk of “ sparking “.
2. Motors are not normally exposed to air or to gas atmospheres above the liquid or where they are they do not include opening/closing contacts.
3. For mechanical equipment, this shall only include equipment which under normal operating conditions does not :
 - increase its surface temperature appreciably
 - have opening and closing contacts
 - have impacting items or devices

A non electrical assessment based on EN 15198 and EN13463 – 1:2001 for ignition sources in normal operation should be undertaken where applicable/possible.

4. All equipment must be earthed and earth bonded.
5. All equipment must have minimal capacity or capability for producing static.
6. Mechanical equipment such as bearings, seals and mechanical piece parts operating slowly and in a damp or wet environment is acceptable.

3.10.2.9 For ST Zone BZ installations, labels nominal size 50 mm x 100mm with the text “ST Zone BZ“ (White, Black, White) shall be installed on :

The control panel door
The kiosk door

For labelling requirements for the other statutory zones please consult with Severn Trent Water

3.10.3 In addition to the specified information identified in Sewers for Adoption 6th Edition Severn Trent Water require 3 copies of the pumping station maintenance manual. These shall contain record drawings, wiring diagrams and pump details.

3.11 **KIOSK**

3.11.1.1 e A separate lockable storage kiosk for storing barriers, davit and winch equipment shall be provided. The door to the storage kiosk to have the same locking and hinge arrangements as the doors to the motor control panel kiosk.

3.11.2.7 The Developer should seek advice from Severn Trent Water on expected vandalism levels and Electro Magnetic Conductivity (emc) levels.

3.11.2.9 Kiosk Colour : Alternative colours shall be provided where required by the Planning Authority.

3.11.2.12 The kiosk doors shall be fitted with a cylinder type locks.

3.11.7.1 Severn Trent Water can offer to install and commission the telemetry system. There is a standard charge for this service. The Developer should consult Severn Trent Water for details.

3.11.7.2 Severn Trent Water require the following telemetry signals

STW Standard Signals List New Build Design 2 Pump Station		
	Signal Type	Signal Title
Digital Inputs	DI 1	Pump 1 Running
	DI 2	Pump 2 Running
	DI 3	Pump 1 Available
	DI 4	Pump 2 Available
	DI 5	Pump 1 Failed Reset in Progress
	DI 6	Pump 2 Failed Reset in Progress
	DI 7	Power Failed
	DI 8	Wet Well High Level Spill
	DI 9	Wet Well High Level Action Point
	DI 10	Ultrasonic Level Instrument Failed
	DI 11	Rising Main Flowmeter Failed
	DI 12	Back Up System Operating
Analogue Inputs	AI 1	Wet Well Level
	AI 2	Rising Main Flow
Pulse Inputs	PI 1	Rising Main Total Flow
Outstation or Telemetry Computer Derived Signals	DD 1	Pump 1 Failed
	DD 2	Pump 2 Failed
	DD 3	Multiple Pump Failed
	DD 4	Potential Rising Main Blockage
	DD 5	Potential Rising Main Burst

STW Standard Signals List - Flowmeter		
	Signal Type	Signal Title
Digital Inputs	DI 13	Flowmeter failed
Analogue Inputs	AI 3	Flow
Pulse Inputs	PI 2	Totalised flow

Digital Inputs must be installed such that a closed contact represents the healthy state. If the contact is fed from a relay, this relay must be energised when the equipment is healthy. This configuration ensures that if the circuit becomes disconnected, the alarm will be generated. (i.e. failsafe)

Analogue Inputs must be calibrated / commissioned such that 4mA represents a zero measurement and 20mA represents full scale measurement. This configuration ensures that fault conditions such as a circuit disconnection can be distinguished from a zero measurement.

Digital Outputs must be installed such that one digital output is used to start the equipment and another digital output is used to stop the equipment. The outputs will be configured to issue a pulse to change the state of the equipment. This configuration ensures that should the telemetry outstation fail, the state of the controlled equipment does not change. Latched contacts may be configured in for specific conditions in accordance with the signal provision standards list.

Pulsed inputs must be installed, when a totalised counting function is required, for example a totalised flow from a flowmeter.

Derived digitals may be configured in the telemetry outstation in eSCADA. These may take the form of digital or analogue signals and are usually a combination of signals or functions. These are not applicable to the site works contractors

The Developer should consult Severn Trent Water for further details.

3.12.5.2 The colours of wiring insulation shall conform to the current STW Engineering Specification ME1A. Copies can be obtained from Severn Trent Water. An extract taken from the current edition is shown below:

The colours of wiring insulation shall be -

□□Brown	L1 Phase1
□□Black	L2 Phase2
□□Grey	L3 Phase3
□□Blue	N Neutral
□□Red	110 V ac Live & Neutral Control
□□Violet	48V ac and below Live & Neutral
□□Brown	Star Contactor Link and CT secondaries
□□Pink	D.C. +ve and -ve
□□Orange I	Intruder voltage circuits (with the exception of Telemetry circuits at 24v and below)
	Intruder voltage circuits are defined as a Voltage source derived external to the assembly, which enters a compartment. There shall be continuity of cable color consistently adopted throughout the entire circuit.
□□White	Telemetry
□□Grey Outer, Red & Blue Inner	4-20mA Analogue
□□Green and Yellow	Protective earth conductors
□□Green	Functional Earth

3.13.1.3 Severn Trent Water requirement is for distribution board. For all the none loads including:

- Internal lighting
- Anti condensation heater
- Telemetry unit
- RCD protected power socket

3.13.3.7 Auto reset must only be applied when the pump is submerged and not exposed to a sewer derived atmosphere.

3.13.4.1.c. The level control unit shall provide signals or control at the following:

Level DPH	Start Duty Pump
Level DPL	Stop Duty Pump
Level APH	Start Assist/standby pump
Level APL	Stop Assist/standby pump

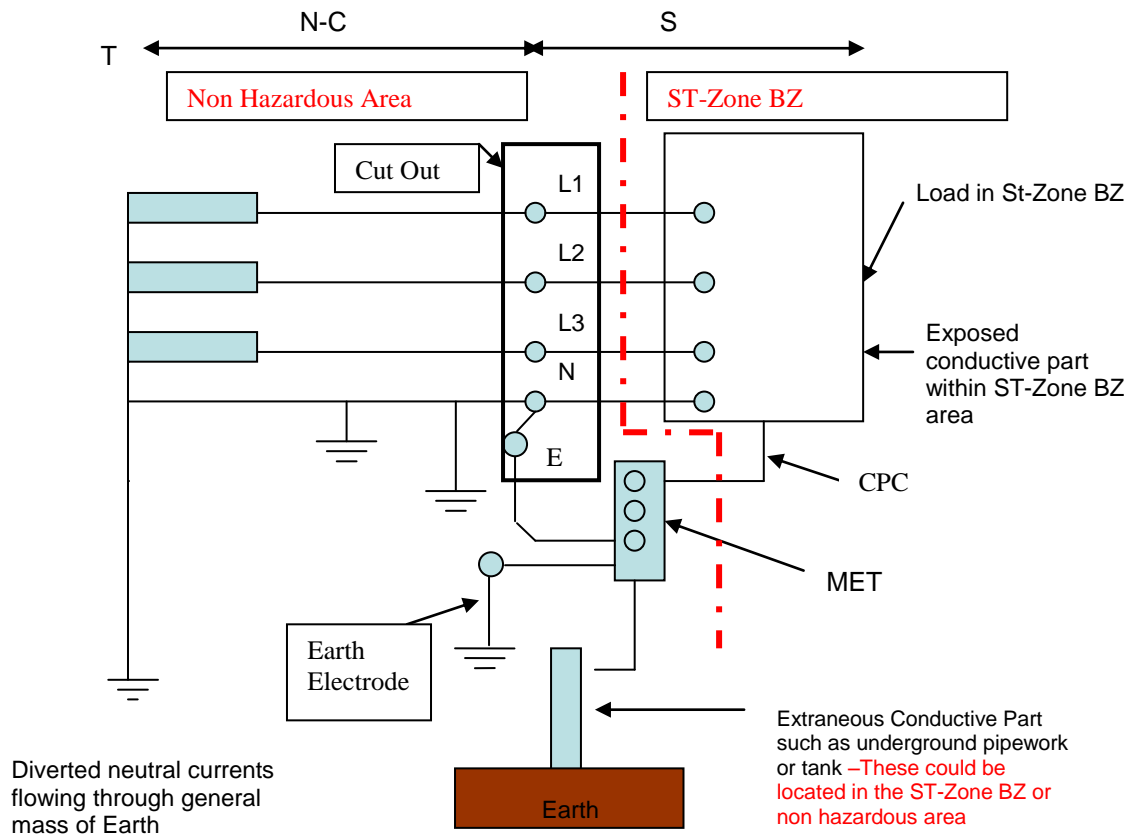
None of the levels DPH, DPL, APH and APL shall be coincident.

3.14.3.4.c&e The pump set cables require two ducts to be provided, each 100 mm in diameter. The telemetry cable requires one duct to be provided, 100 mm in diameter.

3.14.5.1 An earthing system is required to be installed on all installations in accordance with the requirements of BS 7671 and IEE Guidance Note 8, Earthing and Bonding and BS7430.

TN-C-S in addition to the TN-C-S (PME) earthing system an isolating transformer shall be required. This installation shall include a local earth electrode.

This sketch provides an indication of intent from which the detail design may be developed.



3.14.5.4 Generator Connection facilities – an earth electrode system is required as part of the electrical installation. It shall be designed to be utilised for this purpose and for earthing of the hazardous area.

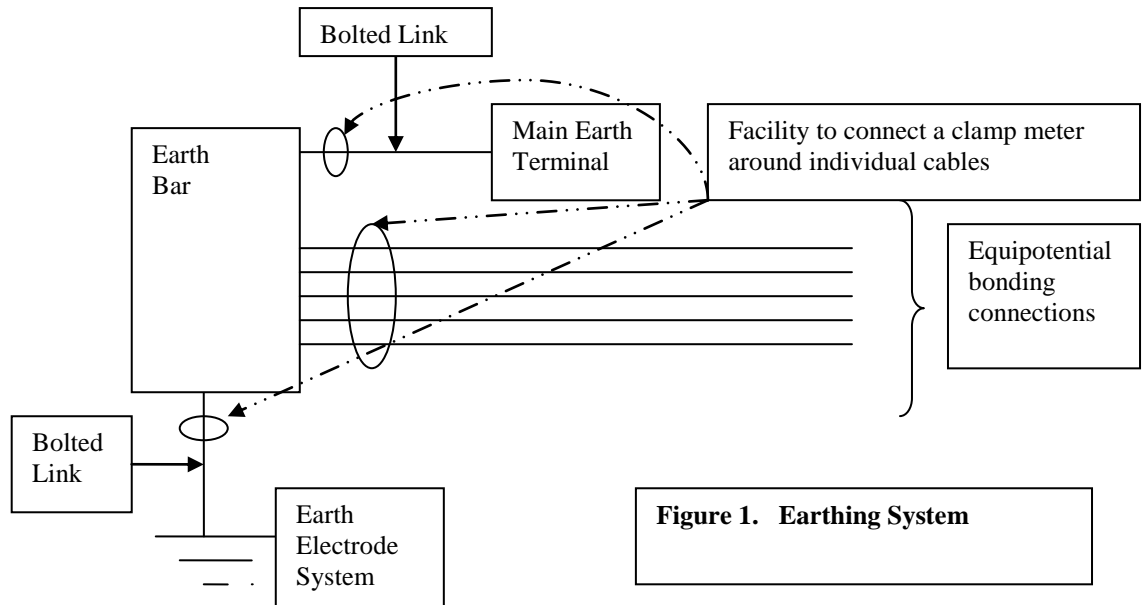
Earth Electrodes are to be selected and sized in accordance with BS7430 Table 4. Earth resistance should not exceed 20 Ohms. The earth resistance shall be measured and recorded on the Certificate of Earthing and Bonding.

3.14.5.5 Installation Requirements – PVC coated copper tape or cable shall be used for all bonding applications and shall be unbroken at intermediate points (refer to IEE Earthing and Bonding Guidance Note 8 Section 5.2)

The size of earth conductors is required to be calculated in accordance with the requirements of BS 7671 and shall be the same size as the phase conductors as a minimum.

Each point of connection shall be protected using an anti corrosion and sealing product.

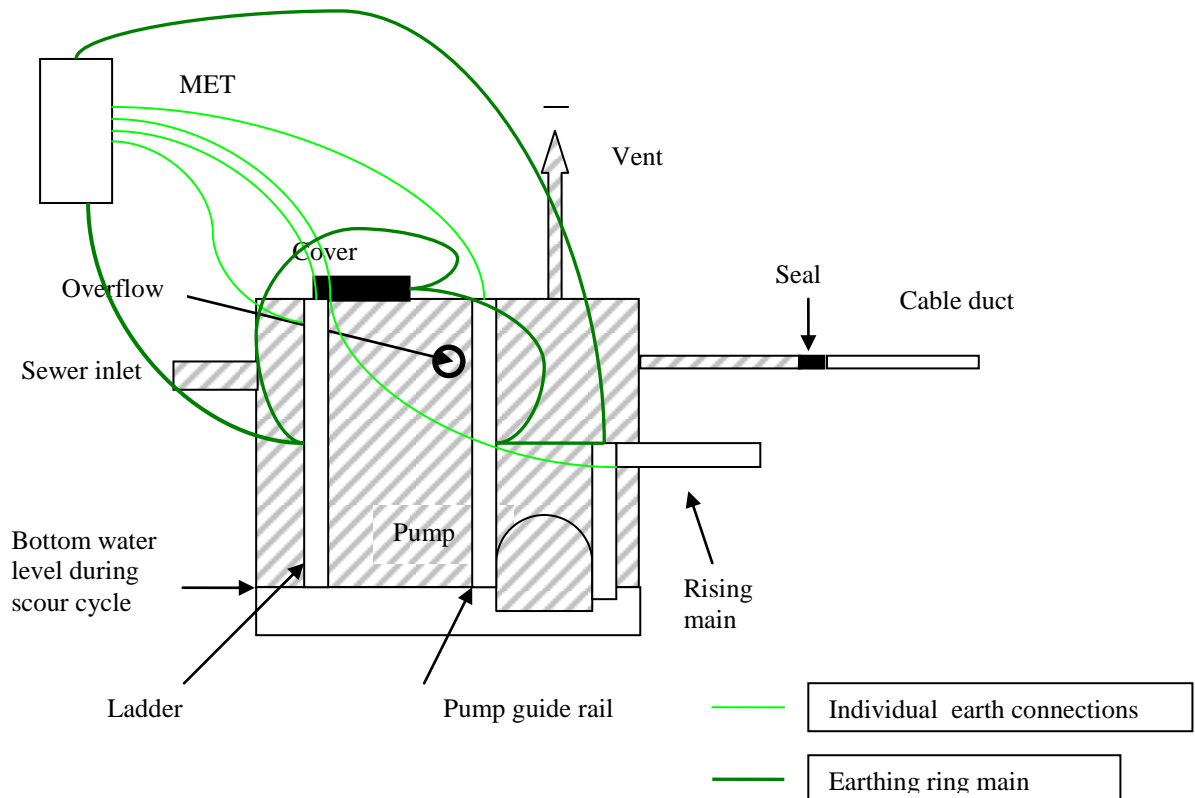
3.14.5.7 Equipotential Bonding System – All exposed and extraneous-conductive parts of the installation within the hazardous area shall be connected to the equipotential bonding system on a separate earth bar as detailed in the sketch below.



The earth bar shall be connected to the main earth terminal using a bolted link.

If the connection points are not readily accessible each item shall be connected separately to the earth bar twice, each connection point is required to be separate. Alternatively one individual connection and an earthing ring main may be installed. If a ring main is utilised Continuity of the main equipotential bonding conductor shall be maintained (refer to IEE Earthing and Bonding Guidance Note 8 Section 5.2)

This is required to ensure that a poor connection can be identified when tested. A typical example of this is shown in the sketch below.



3.14.5.8 Supplementary Equipotential Bonding – This should be carried out as required to ensure compliance with BS 7671 and with reference to IEE Earthing and Bonding Guidance Note 8.

3.14.5.11 Testing - The earth leakage current for each completed installation shall be tested and recorded on the Earthing and Bonding Certificate. The current shall not be greater than 50mA.

The facility for non disconnection type testing shall be provided in the earth bonding installation to ensure that each equipotential bonding circuit can be tested. Each equipotential bond shall have a resistance of less than 1 Ohm.

3.14.6 **FLOWMETER**

3.14.6 a Electromagnetic flowmeter shall be designed and installed in accordance with BS EN ISO 6817

3.14.6 b It shall be equipped with a flow sensor and a separate converter (transmitter) which shall be installed remotely from the flow sensor

3.14.6 c The flow sensor shall not incur a hydraulic head loss greater than 0.5 m when conveying maximum flow and shall not contain obstructions liable to restrict flow.

- 3.14.6 d** Flow sensors shall be protected to BS EN 60529 – IP 68 (5 m depth of submergence). Signal convertors shall be protected to BS EN 60529 – IP 65
- 3.14.6 e** All equipment shall be suitable for operation in ambient temperature -10C to +55C. In addition, signal convertors installed outdoors shall be protected from the effects of wind-chill and direct sunlight.
- 3.14.6 f** The overall accuracy, as defined by WIS 7-03-01 shall be 1%. The flow sensor shall be suitably rated for the range of pressures within the installation. In addition it shall be capable of withstanding a pressure equal to twice the normal operating pressure for a period of one minute without affecting the overall accuracy on return to normal rated pressure
- 3.14.6 g** Flowmeter flanges shall be to BS EN 1092 part 2
- 3.14.6 h** The input voltage to the flowmeter shall be 110V a.c. Local rate of flow indication shall be provided by a digital LCD indicator which, together with a totaliser, shall be mounted integral with, or adjacent to, the signal convertor. In addition, a pulsed output signal and an isolated analogue signal shall be provided. The 4-20 mA analogue signal shall be linearly proportional to the flow rate. The signal convertor shall be connected to the flow sensor by a suitably unjointed length of cable
- 3.14.6 i** The flowmeter shall be installed in accordance with the manufacturer's recommendations and the certification requirements. The flow sensor shall be installed with all necessary earthing electrodes, gaskets and earthing straps and be bonded to earth. Upon completion of the installation of the flow sensor, any spare cabling shall be left neatly coiled and clipped.
- 3.14.6 j** The Developer shall supply a calibration certificate with the flowmeter that shall be issued by a NAMAS calibration laboratory. In addition details of the methods to be used for carrying out in-situ validation checks shall be provided.

The full STW M & E specification for electromagnetic flowmeters can be obtained from Severn Trent Water.

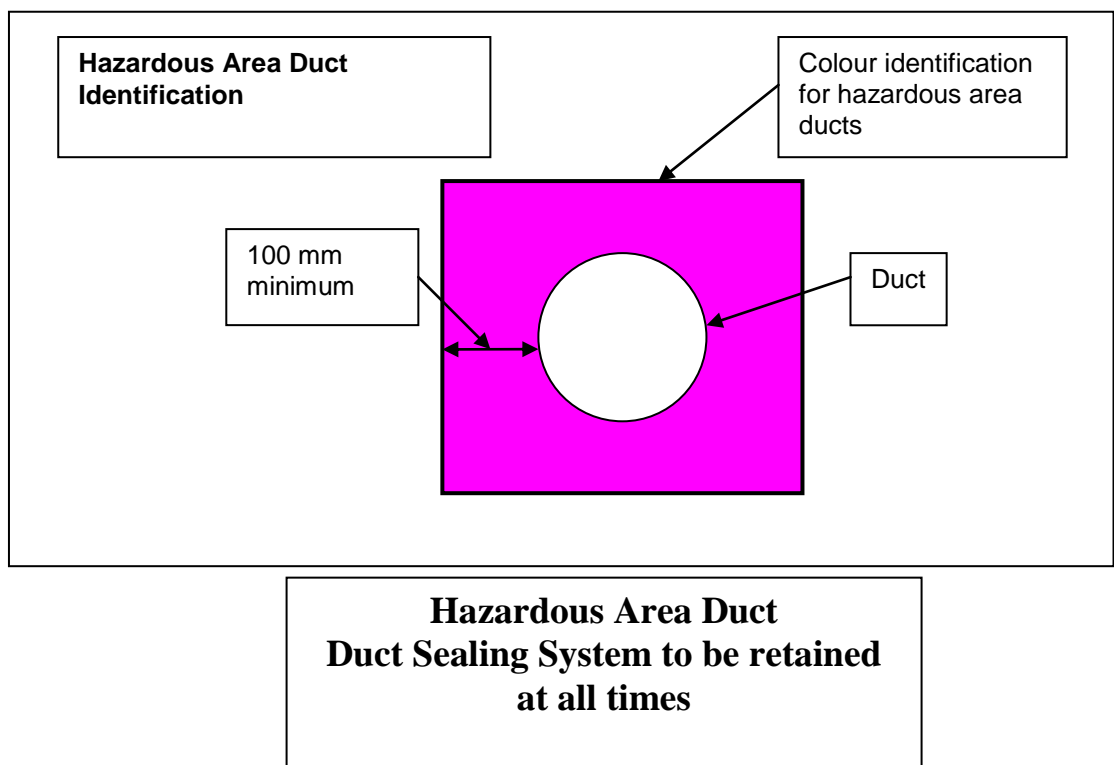
3.14.7 FLOWMETER CONTROL PHILOSOPHY

- 3.14.7.1** The flow transmitter connected to the flow sensor shall include the following features
- a) Minimum 4 output relays
 - b) Programmed parameters stored in non volatile memory
 - c) Integral LCD display includes level, relay status and programming data with display being interactive in the programming mode
 - d) 110V ac input

- e) 4-20 mA analogue signal output capability with a 750 ohms loading
- f) Pulse output capability to give totalised flow output
- g) Proven use within the waste water industry and suitable for out door installation rated at IP68

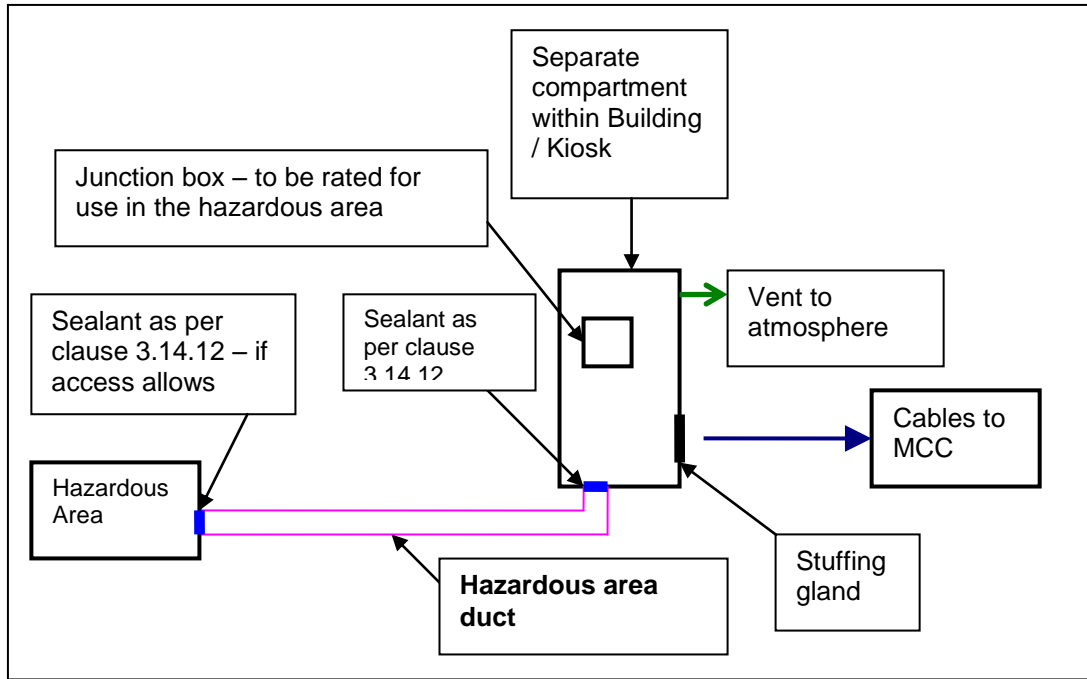
3.14.8 Duct Identification – All ducts to and from a hazardous area (including STW -Zone BZ) are to be clearly identified by use of pink paint (BS4800 02 C 37) and labelling at the ends of ducts. Paint to be applied in a square around the end of each duct as detailed below,

Labelling is required to be installed adjacent to the ducts and shall state the following:

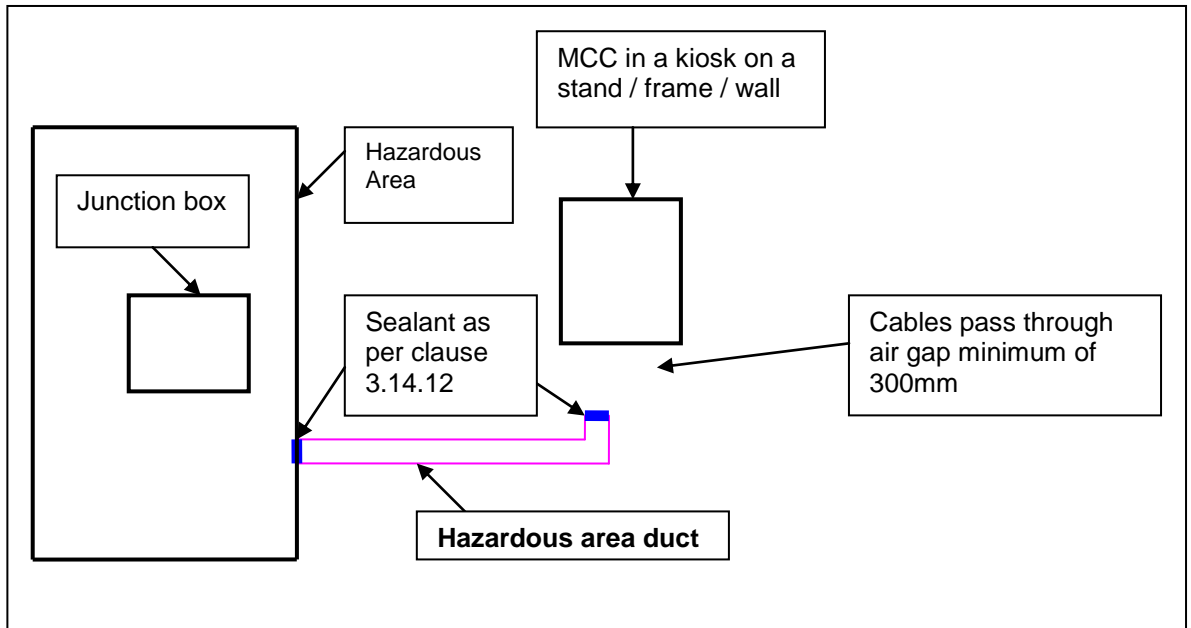


3.14.12 Sealing of ducts - Duct connections into hazardous areas shall be provided with a means to ensure vapours, products, gases etc do not migrate into areas inappropriately. Severn Trent Water uses a methodology based upon “block and bleed” where the duct is provided with a block or inhibit to the flow of the possibly hazardous substance and a means by which any hazardous substance which bypasses the “block” is allowed to dissipate safely. See sketch and sealant detail below.

Ducts leaving a hazardous area or a STW Zone BZ and entering directly into a kiosk shall do so in a separate compartment which shall be sealed from the rest of the kiosk to IP55 rating and ventilated to atmosphere. The ducts shall be sealed at the entrance into the compartment.

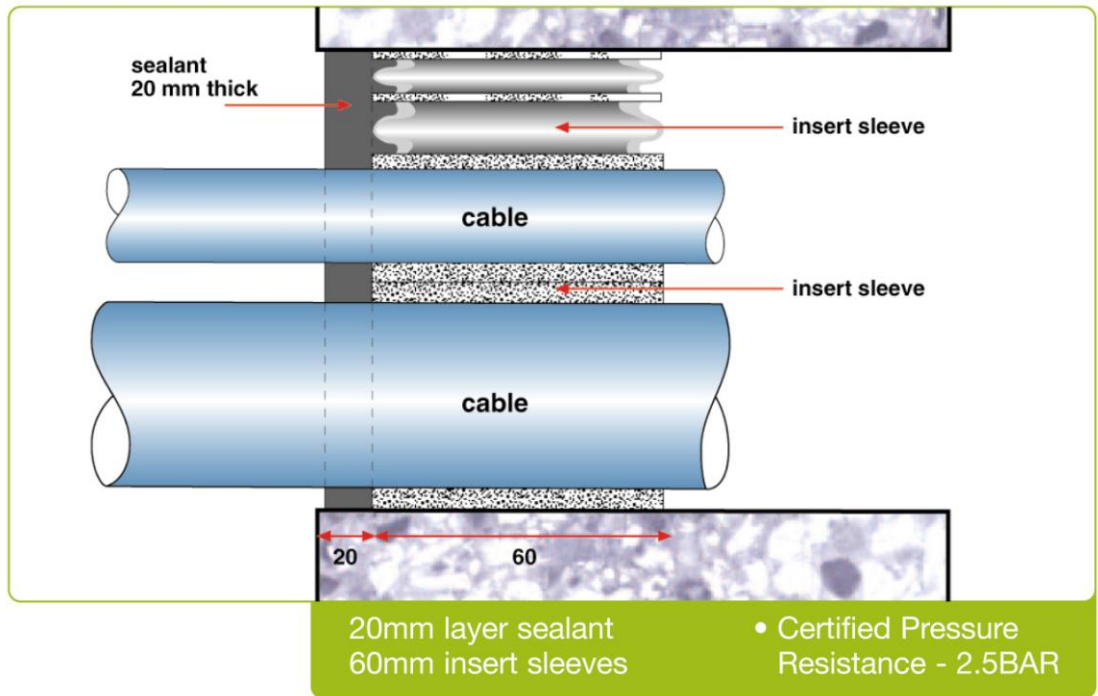


Ducts leaving a hazardous area or a STW Zone BZ and delivering cables to a junction box or a kiosk on a stand shall be sealed as they exit the ground, cables are required to pass through a minimum unobstructed air gap of 300 mm before entering the enclosure.



A proprietary duct or cable transit sealing system which ensures Lloyds certified minimum 1 bar gastight and 2.5 bar watertight seal and age tested for 50 years shall be used. This system shall consist of thermoplastic 60 mm long tubular water resistant split sleeves and a silicone based fire rated, water and gastight sealant as shown below. The insert sleeves shall be used to ensure cable separation and to pack any free space in the penetration allowing for easy addition/removal of future cables. Sealant shall be applied to the face of the penetration ensuring a

pressure tight seal is maintained, sealant to be applied to a minimum depth of 20 mm. The system shall be installed in accordance with the manufacturer's installation instructions.



NOTE: The above clauses also apply where relevant to the equivalent clauses of PART 4 – M&E SPECIFICATION FOR MICRO PUMPING STATIONS