SOUTHERN WATER
TECHNICAL SPECIFICATIONS MANUAL
MECHANICAL AND ELECTRICAL SPECIFICATIONS

SOUTHERN WATER SUPPLEMENTARY ADDENDUM TO SEWERAGE SECTOR GUIDANCE -APPENDIX C – DESIGN AND CONSTRUCTION GUIDANCE (DCG) VERSION 2.3

1. OBJECTIVE

This document is Southern Water's Local Practice addendum to Parts B, D, E & F of Water UK's Sewerage Sector Guidance -Appendix C – Design and Construction Guidance (DCG) Version 2.3 DCG and shall be read in conjunction with that publication.

2. GENERAL

2.1 General

Where conflict exists between DCG and this addendum, this document shall take precedence. Section/clause numbers used in this specification are those from DCG, except where further clauses are added, and these use similar numbers added at the end of each DCG clause series.

The Developer shall ensure compliance with the latest versions of all appropriate legislation Codes of Practice and ensure the installation is safe, serviceable and fit for purpose.

2.2 Technical Submissions

The Developer shall ensure that all technical submissions include the full requirements specified in SSG Appendix D – Stage 2: Design of a New Sewerage System, together with the following additional information:

- Pump and System Curves
- Surge Analysis (> 500m long rising main)
- Hazardous Area Zoning Drawings and Risk Assessment
- Drawings of pumping station, to include but not limited to: benching, baffles/drop pipes, emergency storage details, lifting equipment, pump start/stop levels, cable ducts, junction boxes, access covers (shown open and closed), bollards
- Flotation Calculations
- Pumping Station Instrumentation and protection details
- VSD specification
- Retention times and chemical dosing (if applicable)
- Schematic and layout drawings of each enclosure/panel and cabling
- Back-up generator provision/connection details
- Telemetry equipment and P/STN line
- Fencing and Vandalism risk assessment
- Compound fencing details
- Details of the fences access gates (shown open and closed positions)
- Tanker route and tracking, inc. parking restrictions
- Street lighting diagram
- Marked easement drawing showing rights of access
- Position of habitable dwellings local to the PS

3. PART B – DESIGN AND CONSTRUCTION OF NEW FOUL SEWERS AND LATERAL DRAINS

Figure B.23 Typical Manhole Detail

Ladder detail as shown in Type A1 manhole shall not be installed. Ladder brackets shall be installed as per SW typical detail drawings A81945.1001 & 1002. This clause shall apply for all manhole figures in DCG which show a ladder.

4. PART D – PUMPING STATIONS

D3 DEFINITIONS

3. Snore – The Undertaker does not permit the "snoring" of pumps; instead the pumps are permitted to "scour". This is where the level is pumped to the lowest possible level to clear debris, yet does not allow the pump to "snore" i.e. draw in air. This level is typically vertically central to the pump volute or 50mm above the bottom of the volute, which is ever higher. Note despite the Undertaken not permitting "snore", the pumps should still be capable of operating at "snore" for a minimum of 15 seconds without contravening the pumps UKEX/ATEX status.

D5 PROVISION OF PUMPING STATIONS

D5.2 Site Access

D5.2.2 A safe and reasonable vehicular access should be provided to the pumping station at all hours for the purposes of repair, tankering and maintenance. Access should be directly from the public highway or by the provision of a dedicated access road, a check shall be made to ensure that access is suitable from a main road to the pumping station for the minimum tanker size. Vehicles should not be permitted to park in front of the vehicle access point to the pumping station, where required yellow hatching and 'do not park' signs shall be erected. Long reversing routes are not acceptable. Shared access with domestic driveways is not suitable. The design shall demonstrate through calculations/Swept Path Analysis or other accepted means, that the road geometry is adequate to accommodate tanker access.

D5.2.4 Access shall allow for a minimum tanker size of 18,000 litres (4000 gallons).

D5.2.7 For Easements appertaining to pumping stations contact Southern Water Developers Services for the "full Deed of Easement"

D5.3 Site Layout

D5.3.4 The need for a fenced compound, and its type shall be agreed with the Undertaker and local planning authority. Generally, a fenced compound shall be provided for Type 2,3 & 4 pumping stations.

D5.3.5 Where security fencing is considered necessary, the type of fencing shall adhere to CED 4008, SEC250 and SEC250a.

D5.3.7a The gates shall open outwards to 180 degrees if opening against the fence line or 270 degrees on corner posts, to ensure gates do not obstruct rights of way. Gates shall latch in fully open and closed positions and provide a clear opening of at least 3.8m. Gates shall be able to close with vehicles inside as per Southern waters closed gate policy.

D5.3.7b The gap beneath the gates shall be no greater than the gaps between the palings.

D5.3.7c Steel gate posts shall be fabricated hot dip galvanised and hinges must be on the outside.

D5.3.10 Permeable hardstanding around inlet and valve chambers shall be hollow cell paving (e.g. hollow PCC blocks, recycled modified polymer grids) or similar types overlaying geotextile membrane and filled with aggregate. Impermeable hardstanding should be laid to minimum falls of 1:40 for hardstanding areas, 1:50 for bituminous road and 1:60 for concrete roads, such that surface water cannot pond.

D5.3.15 Refer to section D7.9.

D5.3.17 Compound hardstanding shall be of an impermeable material, such as brushed concrete, which shall be level with access covers and 150mm above tanker hardstanding.

D5.5 Storage

D5.5.5 An emergency overflow shall only be provided where agreed by the Undertaker and the Environment Agency. Any overflow shall not operate until all of the storage volume specified has been fully utilised.

D5.7 Pumping Station Design

D5.7.1 Pumping station design shall be as follows:

Design	Type 1	Type 2	Type 3	Type 4
Package pumping station in dry chamber	√			
Package pumping station with wet well	√	√	√	
Bespoke pumping station	√	√	√	
Undertaker's specification pumping station				√

- Package pumping stations in dry chambers, shall comply with the Undertaker's specification MED 4142 and shall only be used where agreed by the Undertaker
- Package pumping stations with wet wells, shall comply with this specification and P&ID JN.900003.0P0008 (not WIS 4-04-2)
- Bespoke pumping stations, shall comply with this specification and P&ID JN.900003.0P0008
- Undertaker's specification pumping stations, shall comply with the Undertaker's Technical Specifications Manual, Design Drawing Manual, Commissioning Manual and Works Operating & Maintenance Manual.

D6 RISING MAINS

D6.3 Hydraulic Design

D6.3.2 K_s values shall be based on CED 4010. Table 2.4.1

D6.3.3.a Chemical dosing, for the reduction of septicity, shall only be used where there are no other practical options, and by agreement with the Undertaker. Any chemical dosing installations shall be in accordance with MED 4008.

D6.3.3.d Air valves shall be of the double orifice type, fitted with an auxiliary float chamber and complying to the following:

- WIMES 8.08
- A ¼ turn, full bore, drain valve shall be fitted to the draining boss.
- Installed in accordance with CED 4010

D6.5 Materials for Rising Main

D6.5.2 Rising Mains shall be constructed from materials selected from Table 1B of CED 4002. Rising Mains shall be connected as close as physically possible to pumping station structures and other ancillaries.

D7 DESIGN OF PUMPING STATIONS

D7.1 General

D7.1.3 "snore" to be replaced with "scour"

D7.1.5 Chemical dosing, for the reduction of septicity, shall only be used where there are no other practical options, and by agreement with the Undertaker. Any chemical dosing installations shall be in accordance with MED 4008.

D7.2 Hazardous Areas

D7.2.1 For the Undertaker's hazardous zone classification requirements refer to the Undertaker's specification MED 4004 and the following clauses:

- Equipment used in classified areas under DSEAR shall be selected in accordance with Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations and shall be UKCA or CE marked
- Electrical equipment and systems shall comply with all relevant parts of BS EN 60079 and shall be certified for use in the appropriate zone for the appropriate hazardous substance and for the intended application.
- Non-electrical equipment and systems shall comply with all relevant parts of BS EN 80079-36 and shall be certified for use in the appropriate zone for the appropriate hazardous substance and for the intended application.
- Electrical/Electronic/Programmable Electronic Safety-related Systems shall comply with all relevant parts BS EN 61508 and BS EN 61511.
- Equipment shall be installed, operated and maintained in accordance with the manufacturer's instructions to ensure that equipment certification is not compromised. This shall include, but not be limited to: positioning, operating parameters/levels, monitoring equipment/instrumentation, interlocks/inhibits/resets, protection devices, back-up controls, etc.
- If a motor certified for use in a classified area is to be supplied for use with variable speed or other electronic equipment, then it shall be confirmed that the motor certification remains suitable for the application.
- Certification information for Hazardous Area equipment shall be clearly presented on a manufacturer's nameplate. Where certified equipment as part of a system is not individually identifiable by an existing label (e.g. submersible pumps) an additional label shall be provided to enable identification and tracking for maintenance purposes.
- Maintenance for equipment within DSEAR zoned areas shall follow the HSE code of practice and guidance: "Safe maintenance, repair and cleaning procedures, Dangerous Substances and Explosive Atmospheres Regulations 2002 (L137)". Maintenance of electrical equipment in

DSEAR zoned areas shall be in accordance with BS EN 60079. Maintenance tasks shall be uploaded to the Purchaser's Maintenance Management System.

- Equipment which is rated as Category 3 or Category 2 Non-electrical, under the 'Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations', shall have a review of the self-certified technical file by an independent UKAS (or equivalent) company, accredited to BS EN 60079 and BS EN ISO 80079-36 or the standards that relate to the specific protection method employed for the equipment. The review shall consist of a desktop review of the documentation within the technical file, and does necessarily not need to include the physical or visual assessment/testing of the equipment. The purpose of the documentation review is to provide feedback regarding the adequacy of the technical file, in respect to the appropriate design principles having been followed and the compliance strategy applied. The deliverable shall be a letter summarising and concluding the findings of the review and does not necessarily need to be a certificate.

D7.3 Wet Well - General

D7.3.2 A drop pipe shall be provided as follows:

- Where pumped flow is greater than or equal to 25 l/s
- Where pump flow is below 25 l/s and the well inlet is >1.5m from the pump start level

D7.3.10 Velocities within the wet well and valve chamber pipework, shall be as follows:

DN	V_{min}	Discharge	
		V_{design}	V_{max}*
80	0.40	0.60	2.25
100	0.50	0.70	2.50
150	0.60	0.90	2.50
200	0.70	1.10	2.50
250	0.80	1.20	2.50

D7.4 Wet Well -Structural Design

D7.4.7 All chambers shall withstand all necessary loads in accordance with BS EN 1990, including the following loads:

- Internal hydrostatic pressure
- External hydrostatic pressure from groundwater up to the finished ground level
- External ground pressure
- External imposed loads

D7.4.8 Where a wet well comprises a prefabricated impermeable liner with in-situ mass/reinforced concrete, it shall be capable of withstanding hydrostatic pressure equal to depth, regardless of any provision of concrete surround.

D7.4.9 Pumping stations shall incorporate fixing devices to prevent rotation or flotation of the empty structures when subject to groundwater pressure up to the finished ground level.

D7.4.10 Type testing of prefabricated impermeable liner wells shall involve the following:

- An internal water pressure test shall be carried out in accordance with BS EN 12050 Part 1 Clause 5.2.1. If there is no visible leakage from the liner well during the test, it shall be considered to have passed the test
- The prefabricated impermeable liner well shall be able to withstand the worst-case design of groundwater pressure, or the equivalent mechanical load, without distortion and without the provision of a concrete surround. If there is no visible leakage, or damage sufficient to cause leakage, in the pumping station during the test, it shall be considered to have passed the test
- A discharge pipe connection test shall be carried out in accordance with BS EN 12050 Part 1 Clause 5.2.3. If there is no visible leakage of water from the discharge pipe during the test, it shall be considered to have passed the test
- A structural behaviour test shall be carried out in accordance with BS EN 12566 Part 1 Annex D Clause D.6. For a pumping station made of concrete or GRP, if there is no structural failure during the test and no lack of watertightness is recorded, it shall be considered to have passed the test
- Self-cleansing test shall be in accordance with WIS 4-04-02 clause 12.1.9

D7.5 Valve Chamber

D7.5.2 For Type 1, 2 & 3 pumping stations, where the rising main is horizontally less than or equal to 20 metres in length and has a permanent free discharge (with no risk of surcharge), then the isolation valves, non-return valves and Bauer coupling can be omitted, and dual rising mains installed.

D7.5.3.c The Bauer coupling shall be installed such that the connection of a flexible hose can be made without entry to the valve chamber.

D7.5.4 The discharge point of the gravity drain shall be fitted with a plastic flap valve having a stainless steel pin. A hand-operated valve within the gravity drain is not required.

D7.6 Flow Metering

D7.6.1 A single electromagnetic flowmeter shall be installed where an individual pump rating is 22kW or higher

D7.7 Access into Wet Well, Valve Chambers and Flowmeter Chambers

D7.7.2.b Hinged covers shall always be provided (minimum of 2). The hinged cover should incorporate a facility for securing a recessed padlock. Additional facilities for opening the covers shall also be provided, such as eyeholes for standard lifting keys or flush mounted integral handles.

D7.7.2d A safety grille should be incorporated in the cover where there are access openings over a fall greater than 1000 mm to minimise the risk of personnel falling through the opening. The design shall allow for maintenance to be carried out with the fall protection in place. Integral fall protection shall be in the form of a hinged safety grid capable of withstanding a 250 kg load. Where a

cover has more than one leaf, each shall have its own fall protection. With all leaves open the fall protection shall fully cover the opening.

D7.7.2.j Assistance to ensure a lifting effort not exceeding 25 kgF to open the hinged covers shall be via spring and not gas struts.

D7.7.3 A vent stack shall always be provided.

D7.7.3.b Holes/slots drilled in the chequer plate or open mesh flooring are not permitted as a ventilation option.

D7.73.c Where the pumping station and vent stack may cause an odour nuisance in a public area or private residential area, a passive activated carbon filter shall be installed between the vent pipe and the vent stack. The design shall ensure the carbon filter can be easily replaced

D7.7.6 Valve chambers and flowmeter chambers shall be fitted with a ladder bracket (step irons are not permitted).

D7.9 Davit Sockets

D7.9.2 The davit socket shall comply with the following additional clauses:

- Davit socket nominal bore shall be 65 mm
- Cover plate shall be secured with countersunk screws
- The horizontal distance between the centre of the davit socket and the centre of the lifting point on the pump unit shall be 1,200 mm
- Lifting test certificate and Report of Thorough Examination shall be submitted in compliance with the Undertaker's M&E 3015 document. Where the certificate/report has less than 6 months until its next inspection at the time of Adoption, then a further examination shall be undertaken
- The socket shall be stamped with the following:
    - UKCA or CE Marking
    - Safe Working Load
    - Serial Number
    - Undertaker's Asset Number, available from the Undertaker's Asset Integration Team, via the Developer Services Team

D7.10 Kiosk

D7.10.1e For socket details refer to clause F3.4.1.2.

D7.11 Kiosk Construction

D7.11.14 Where double hinged doors are utilised, these shall include shoot bolts fitted to the top and bottom of the left-hand door (when facing the doors from the outside). The right-hand door shall incorporate top and bottom T type handles complete with clamp latches compressing the seal and a cylinder type night latch lock. The lock barrel shall be compatible with the Undertaker's standard access keys for operational sites in that area – refer to SEC manual. Where a single door is utilised then the door shall comply with the right-hand door as above.

D7.11.15 The kiosk LPS1175 security rating shall be SR3 and comply with CED 4019.

D7.11.16f The site information plate shall include the Undertaker's site reference 'Catalogue' number and Undertaker's phone number, available from the Undertaker's Asset Information Team, via Developer Services Team.

5. PART E – CIVIL ENGINEERING SPECIFICATION

E1 GENERAL

Where additional CESWI Clauses are utilised, these shall be read in conjunction with Southern Water Supplementary Clauses, CED 4023.

E1.3 Quality of Materials, Workmanship and Tests

E1.3.3 All gravity pipework up to and including 300mm shall be certified by a recognised third party test body as proven to withstand a jetting pressure of 2600 psi (180bar). All ancillary equipment (excluding manholes and other chambers) made of plastic materials and elements in association with such pipework must be similarly proven to withstand jetting pressure of 2600 psi (180bar).

E2 MATERIALS

E2.37 Ladders

E2.37.1 Ladders shall not be installed in manholes. A ladder bracket shall be installed as shown in SW typical detail drawing A81945.1001 & 1002.

6. PART F – MECHANICAL AND ELECTRICAL SPECIFICATION FOR SMALL PUMPING STATIONS

F1. GENERAL

F1.2 Operation and Maintenance Documentation

F1.2.1 The primary purpose of Operation and Maintenance documentation (O&M) is to convey information on safe operation and maintenance of the site, its equipment, and system. The O&M shall comply with the following:

- Shall be designed to provide details of all installed equipment, describe how the pumping station will operate and how it is to be maintained
- Where the site has an overflow, emergency storage capacity or any other unusual system this shall be included in the manual with an explanation of how the system is integrated with the pumping station
- One paper copy of the O & M must be submitted to the Undertaker on issue of the provisional certificate for approval
- Once approved a further two copies of the O&M including all in-date certificates, and one electronic copy, must be submitted to the Undertaker one month prior to the pumping station being handed over
- Paper copies should be in an A4 folder or similar. The electronic copy shall contain PDFs and fully editable files in standard software, e.g. Word, Excel, dwg, etc
- Manuals shall be produced in accordance with the Undertaker's Works Operation and Maintenance manual (WOM)
- The manual shall contain the following sections:

- Site Health and Safety
- Overview of pumping station design and site operation
- Site generator or mobile unit and changeover procedures
- Maintenance procedures and manufacturers' documentation
- Ultrasonic level controller configuration (setup) list
- Flowmeter configuration (where fitted)
- Telemetry configuration list
- Pump unit label data pump system curve and system curve
- Utility account numbers, utility supplier and site telephone number
- Hazardous Area classification documentation
- Certificates, to include, but not limited to:
  - Asbestos free certificate
  - Lifting test certificates and Report of Thorough Examination
  - UKCA/CE certificates
  - Equipment ATEX certification
  - Electrical Installation Completion Certificate (NICECBS 7671)
  - Site pipework and rising main pressure test certificates Rising main Suppliers declaration of suitability for jetting pressure
  - Kiosk security level certificate
  - Rebar CARES, or equivalent, certificate
  - Ready mixed concrete certificate
  - Evidence of "snore protection functioning
  - Prefabricated impermeable liner well test certificates
  - Ready Mix Certificate by an approved third-party certification body accredited by the United Kingdom Accreditation Service (UKAS) for product conformity
  - G5/5 Report
- Drawings and schematic diagrams
- Phase 1 contaminated land report

F2 PUMP UNIT SPECIFICATION

F2.2 Performance Requirements and Information

F2.2.2 Each pump unit shall be capable of pumping the design flow rate when the sewage level is at the mid-point of the start and stop levels in the wet well, plus an additional 5% flow to take account of fall-off in performance due to wear.

F2.3 Design Requirements

F2.3.2 External Corrosion Protection

F2.3.2.1 Corrosion protection shall be suitable for the Corrosion Category and comply with WIMES 4.01, BS EN ISO 9223 and BS EN ISO 12944-2

F2.3.4 Mounting Arrangements

F2.3.4.2 Auto-coupling System (ACS)

F2.3.4.2.1 h The ACS shall be manufactured from cast iron and coated in accordance with WIMES 4.01. The effective sealing between pump and ACS shall not rely on rubber seals, o-rings, etc.

F2.3.6 Impellers

F2.3.6.1 Impellers shall be of the innovative non-blocking design, e.g. Semi open (semi shrouded) – multi-blade/single-blade impeller with close fitting insert ring with integral self-cleaning groove.

F2.3.6.4 Impellers shall not be pinned or screwed to shafts, nor shall shaft rotation be relied upon to ensure that impellers are locked in position. Pump units shall be capable of being reversed (e.g. under de-ragging control) up to 100% of the normal forward running speed.

F2.3.10 Motors

F2.3.10.1 General

F2.3.10.1.3 Motors shall produce efficiencies equal to, or better than, the efficiencies for IE3 motors as stated for non-submersible motors in IEC 60034-30-1.

F2.3.10.6 Insulation

F2.3.10.6.1 The motor insulation class, in accordance with BS EN 60085 (i.e., F, G, H, etc.), shall be at least one class higher than the temperature rise limit, in accordance with BS EN 60034-1, as measured by the resistance of the windings during full load operation, subject to a minimum insulation class of Class H with a Class B temperature rise.

F2.3.14 Pump Unit Lifting Arrangements

F2.3.14.1 General

F2.3.14.3.4 Pump unit lifting chains are not permitted; a lifting location system as described in the DCG shall be safely utilised, thus the pumps shall have appropriate handle fitted

F2.3.15 Cable Support System

F2.3.15.1 Pump cables shall be supported in the wet well by cable socks.

F2.4 Testing

F2.4.2 Testing on Site

F2.4.2.5 Davit socket shall be tested in accordance with D7.9.2.

F2.4.2.6 Pressure pipelines shall be tested in accordance with E7.9 and E7.10.

F2.4.2.7 Electrical equipment shall be tested in accordance with F3.2.1.6 to F3.2.1.8.

F2.4.2.8 All controls, trips, interlocks, alarms and other safety measures to satisfy the UKEX/ATEX certification are in place and have been confirmed reliably operational. This shall include the “snore” protection has been set-up correctly and has been tested at least 5 times to ensure it trips pumps within the time specified by the pump manufacturer’s UKEX/ATEX approval.

F2.4.2.9 Equipment can be safely operated, maintained and removed. Note if there is any doubt over the safe removal of the pumps then a lifting demonstration shall be conducted by the Developer in the presence of the Undertaker.

F3 ELECTRICAL SPECIFICATION

F3.1 Scope

F3.1.1 e For the Undertaker's telemetry outstation requirements refer to clause F3.3.9.1.

F3.2.1 General

F3.2.1.7 Where electronic starters (variable speed, soft start) are employed, the installation shall comply with the planning levels of Energy Networks Association (ENA) Recommendation G.5/5 (or later as amended) and evidence in the form of detailed calculations and/or test certificate from a certified instrument shall be provided to the Undertaker.

F3.2.1.8 The electrical installation contractor shall be currently enrolled in an approved scheme for electrical installations in hazardous areas, e.g. NICEIC Hazardous Area scheme.

F3.2.1.9 Evidence shall be supplied to the Undertaker that the installation complies with The Electricity Safety, Quality and Continuity Regulations 2002 (or later as amended) and BS EN 50160 regarding supply flicker, i.e. proof of compliance in the form of a test certificate from a certified instrument.

F3.2.1.10 The Developer shall be liable for all remedial works where non-compliance with The Electricity Safety, Quality and Continuity Regulations, BS EN 50160 and/or ENA Recommendation G.5/4 (or later as amended) is proven by the Distribution Network Operator, for a period of 2 years from the date of handover to the Undertaker, provided no material changes have been made to the installation by the Undertaker during that period that may affect this compliance.

F3.2.2 Labels and Safety Signs

F3.2.2.1 General

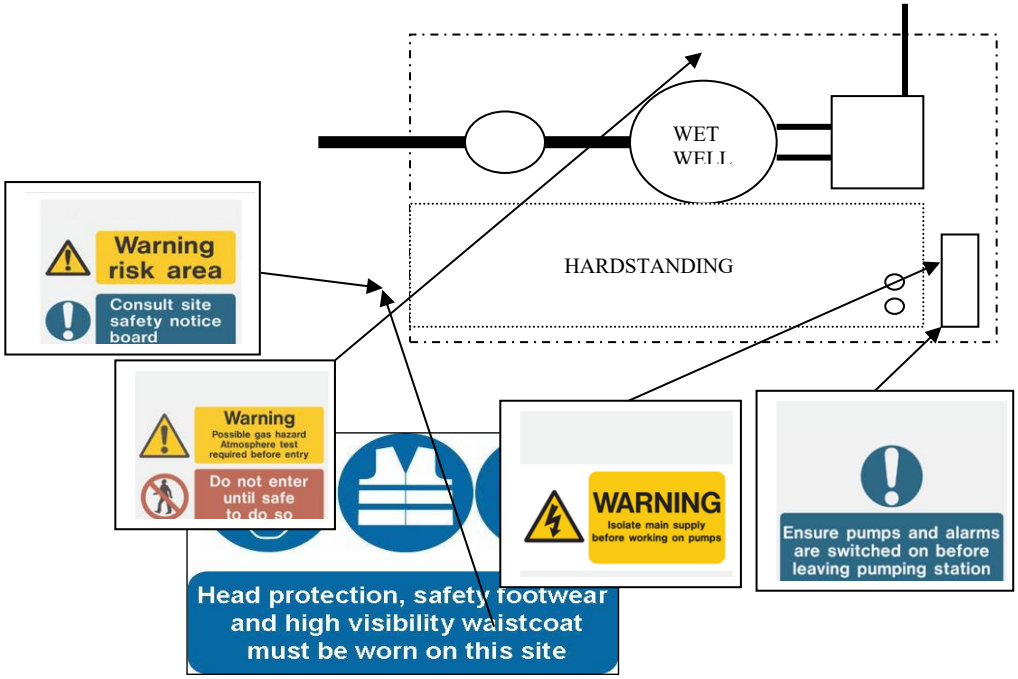
F3.2.2.1.4 Signs and labels shall be manufactured from UV stable semi-rigid plastic.

F3.2.2.2 Labels

F3.2.2.2.3 Above the guide rail of each pump shall be a label depicting the pump number, ie. Pump No.1 or Pump No.2.

F3.2.2.3 Safety Signs

The Undertaker requires additional safety signs as shown below.



The lettering shall be of a size suitable for the application, but not be less than 6mm high.

Warning Risk Area (150mm x 100mm Landscape) and **Head Protection** (400mm x 300mm Landscape) signs shall be positioned externally on the gates.

Warning Possible Gas Hazard (400mm x 270mm Landscape) shall be positioned internally adjacent to the wet well valve chamber.

Warning Isolate Main Supply (150mm x 75mm) shall be positioned on the control panel inside kiosk.

Ensure Pumps (300mm x 200mm) shall be positioned externally on the kiosk doors.

In addition to the above signs a document pouch shall be fixed inside the kiosk for safety information.

Pumps with internal power electronics, which have restrictions on insulation resistance testing, shall have a label fitted to the door of the enclosure of each pump unit motor starter and any junction boxes, providing a warning to ‘not undertake insulation resistance tests’.

Pumps with internal power electronics shall have a label on the pump and the pump unit motor starter, stating the power setting in kW, speed and the ramp-up time in s, where this time has been changed from the factory setting.

F3.3 Electrical Assembly

F3.3.1 General

F3.3.1.2 For sites that come under the scope of MED 4006, the Undertaker has 2 No. Form 2 two pump control panel designs and 1 No. Form 4 two pump control

panel design. The Form 2 control panel designs are detailed in the Wastewater Pumping Station (WPS) Standard Panel Drawings (SPD) Design B 2 Pump Control Panel – up to 15kW and Design C 2 Pump VSD Control Panel – up to 7.5kW. The Form 4 control panel is detailed in the Wastewater Pumping Station (WPS) Standard Panel Drawings (SPD) Standard 2 Pump Panel. All control panel drawings are located in the Design Drawing Manual (DDM). Table 2 – Typical Configuration Of Wastewater Pumping Station (WPS) in MED 4001_B details the form of separation which can be employed at the different pumping station types (DCG, Type 1, 2, 3 or 4)

The Design C 2 Pump VSD Control Panel (up to 7.5kW), shall only be utilised where a VSD application is required or a pump having internal power electronics with automatic blockage detection and self-cleaning technology cannot be used. The Developer shall seek approval from the Undertaker for the proposed design of the control panel if different from the standard designs outlined above.

F3.3.3 Assembly Construction

F3.3.3.4 Doors

F3.3.3.4.5 A triangular key type lock is required on the electrical assembly doors.

F3.3.6 Indicator Lamps, Push-Buttons and Selector Switches

F3.3.6.2 The Undertaker's lamp/button standard colours differ from DCG document, hence for safety reasons the Developer shall conform to the following:

Indicator Lamp Colour	Application
Red	Hazardous or dangerous condition, zoned area ventilation failure, gas detected, over pressure, or emergency stop operated
Green	Normal condition, motor running, valve operating, or on
Yellow/Amber	Machine tripped or overloaded, slow rotation, seal leakage, low flow, or level alarm
White	Available, off, heater on, stopped, or valve fully open/closed or duty or standby level reached. Supply On (where fitted)

F3.3.6.4

Push Button Colour	Application
Red	Emergency stop
White	Start/on/inch
White	Valve open/close
Black	Stop/off
Yellow	Lamp test
Blue	Reset

F3.3.6.7 Indicator lamps shall not form part of a push button or switch. A lamp test facility shall be provided.

F3.3.7 Connection for a Mobile Generator

F3.3.7.3 Where site-specific requirements indicate a fixed standby generator, contact the Undertaker's Telemetry Team, via the Developer Services Team for additional telemetry requirements.

F3.3.7.4 Where a mobile generator connection point is provided, an earth electrode system for the mobile generator shall be provided and connected to the main earth bar of the assembly. This means there is a permanent earth system in place for the generator and appropriate signage shall be provided.

F3.3.8 Abnormal Operation

F3.3.8.2 Pump Unit Failure (initiated by hard-wired pump unit protection systems)

F3.3.8.2.1d The hardwired suction protection device used in the Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel (Form 2), Design C 2 Pump VSD Control Panel (Form 2) and the Standard 2 Pump Panel (Form 4), shall utilise a load/power monitoring device (in motor starter, appropriate to motor rating, capable of reliably and consistently detecting transient conditions when pump begins to draw air). Where the pump is installed in a DSEAR area then the monitoring device shall trip the pump within the time specified by the pump manufacturer's UK EX/ATEX approval. Where the monitoring device cannot reliably and consistently achieve this, then, in addition to the load/power monitor, a secondary level device of a different non-contact technology shall be used (such as radar or laser) to prevent snoring.

F3.3.8.2.1d Pumps shall be provided with all of the following hardwired suction protection to prevent "snoring":

- Motor underload monitoring device, in motor starter, appropriate to motor rating and capable of reliably & consistently detecting transient conditions when pump begins to draw air. Where the pump is installed in a DSEAR application then the monitoring device shall trip the pump within the time specified by the pump manufacturer's UKEX/ATEX approval. Where the monitoring device cannot reliably achieve this, or the pump manufacturer does not allow the pump to "snore" then, in addition to the underload monitor, a secondary level device of a different non-contact technology shall be used (such as radar or laser) to prevent snoring.
- Low flow signal from flowmeter (where fitted)
- Torque monitoring as a function of frequency or speed within VSD (where fitted)

F3.3.8.2.1e Low flow protection signal shall be derived from the pump low flow cut-off signal.

F3.3.8.2.9 All Pump Protection shall operate in AUTOMATIC, HAND, and BACKUP modes.

F3.3.8.2.10 The pumping station shall be capable of being remotely reset via telemetry. However the following alarms are not permitted to be remotely reset:

- Emergency stop
- Motor overtemperature on ATEX pumps
- Snore/scour/low flow/suction protection on ATEX pumps
- Pump Seal Leakage Protection
- Pump Overtemperature Protection
- High Discharge pressure

F3.3.8.2. 11 Pumps and/or drives shall have automatic blockage detection and self-cleaning technology consisting of a sequence of forward and reverse rotations that shall be self- initiated as a result of a deviation from the normal running conditions. For smaller pumps (typically less than 13.5kW) this shall be achieved via the pump having internal power electronics with automatic blockage detection and self-cleaning technology; for larger pumps (typically between 13.5kW and 30kW) this shall be via software within the VSD. The unblocking sequence shall be enabled when the pump is in Auto mode only and is operating between the Start and Stop levels in the wet well. * See note below. The unblocking sequence shall be repeated for a set number of operations between 3 and 12.Where the blockage is not cleared then the system shall:

- Stop and inhibit the pump from running until manually reset
- Illuminate the relevant fault lamp on the panel
- Signal to the PLC/HMI/SCADA to indicate that the system has been activated (where fitted)
- Signal to Telemetry to indicate that the system has activated
- Start the standby pump

The pumps used shall be suitable for reversing and where relevant reversing within a DSEAR environment.

* Consideration shall be made to ensure that there is a sufficient level in the wet well during a pump cleaning / unblocking sequence to prevent a potential for pumps to “snore” or run dry and the volume of the wet well, as limited storage and high flows may not provide sufficient time to permit cleaning cycle.

F3.3.9 Telemetry Signals

F3.3.9.1 The Undertaker’s communication standard for telemetry is ADSL lines. Alternatives to ADSL shall be used only where specifically agreed with the Undertaker on a site-by-site basis.

PSTN lines will be withdrawn from service in December 2025 and thus No new PSTN lines shall be installed.

GSM CSD (Circuit Switched Data) is end of life and could be withdrawn at little or no notice by the network operators. No new GSM CSD connections shall be installed.

Where no existing communication line is available the Developer shall liaise with the Undertaker's IT Department for installation of the new line.

On sites where an existing PSTN line exists and is being considered for use for telemetry then it shall be upgraded to an ADSL line as part of the works. The Developer shall liaise with the Undertakers I.T. Department for this upgrade.

The incoming ADSL line shall be provided with a lightning protection unit (LPU). The LPU shall be installed next to the telemetry outstation and connected to earth in accordance with the LPU manufacturer's recommendations.

The Developer shall provide and install a telemetry outstation with type determined by the Undertaker's OT and Telemetry Team. The telemetry system shall be configured at the Developer's expense and commissioned with the assistance of the Undertaker. This will include Developer participation in point-to-point Input/Output testing to demonstrate the satisfactory operation of the integrated system.

The Developer can obtain further information and a quotation for this work by contacting the Undertaker's OT and Telemetry Team, e-mail address: MailBxTELENQ@southernwater.co.uk

TableF.3 For provision of the 'Maintenance in Progress' signal, an 'Engineer-on-Site' switch shall be provided by the Developer. This switch shall be independent of an external power source, using a mechanical run-down timer allowing the engineer to select any 'ON' period of up to 120 minutes. When in use the switch provides a status signal to the outstation which will report and inhibit alarms for the selected period of time.

TableF.3 A 'Rising Main Delivery flow' telemetry signal shall also be provided for Type 2, as **derived**-flow pulsed inputs from the level controller.

TableF.3 The Undertaker does not require a 'Rising Main Delivery Pressure' signal.

TableF.4 Remote control select signal shall be set to OFF, except where agreed & enabled by the Undertaker's OT and Telemetry Team.

TableF.5 Pump unit underload signal shall be from suction protection, see F3.3.8.2.1d.

Table F.5 Note 2 shall be 'Only required if each pump unit is rated at or above 55kW'.

The pumping Station shall have the facility to automatically reset the pumps via the Telemetry Outstation. The Automatic Pump Reset (APR) function is detailed in clause 7.2 of MED 4408. The APR function shall not operate on activation of the any of the conditions mentioned in F3.3.8.2.10.

F3.3.9.6 Pulsed inputs for high-frequency operation (e.g. derived-flow) shall be solid-state electronic type.

F3.3.10 Ultrasonic Level Controller (ULC) Specification

F3.3.10.1 Normal Operation

F3.3.10.1.2 "snore" to be replaced with "scour"

F3.3.10.1.5 The Undertaker envisages that the technical standard adopted by the Developer for ultrasonic level controllers will be compatible with that used by the Undertaker (so as to secure compatibility, and to avoid other substantive functionality issues).The ultrasonic level controller and sensor shall fully comply with the requirements of MED 4433 (Liquid Level Measurement)

F3.3.10.3 Functionality

F3.3.10.3.7 "snore" to be replaced with "scour"

F3.3.10.3.13 Any backup and cleaning/scour/snore control shall not contravene the pumps UKEX/ATEX status.

F3.3.12 Functional Units – Form 2 Assemblies

F3.3.12.3 Incomer

F3.3.12.3.2a The Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel shall incorporate a 125A 4 pole fuse switch, with 'Mains – Off – Generator' positions, with suitably rated fuses. The Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel shall incorporate a control circuit test facility as detailed in the Wastewater Pumping Station (WPS) Standard Panel Drawings (SPD) Design B 2 Pump Control Panel.

F3.3.12.3.2c The phase failure relay shall be fed via an MCB. The Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel shall incorporate a mains supply monitor.

F3.3.12.3.3a The operating handle for the control panel fuse switch shall be padlockable in the 'OFF' position.

F3.3.12.3.3b &
F3.3.12.3.3d &
F3.3.12.3.4 The Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel shall incorporate MCB fed circuits as per the Wastewater Pumping Station (WPS) Standard Panel Drawings (SPD) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel, in the DDM.

F3.3.12.4 Control Circuit Supplies

F3.3.12.4.6 The control circuit transformer (CCT) for The Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel shall have a 230V primary winding and a 110V or 24V secondary winding with one side earthed. Separate control circuit transformers (CCT) including protection fuses shall be provided for the pump control from the ultrasonic level transmitter and that from the back-up float switch control.

F3.3.12.5 Motor Starters

F3.3.12.5.2 The Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel shall incorporate the following additional motor protection:

- Motor over-temperature protection
- Seal leakage protection
- Dry run protection

F3.3.12.5.4 The equipment mounted on the door of the Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel, shall be as per Wastewater

Pumping Station (WPS) Standard Panel Drawings (SPD) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel– Portrait (Hinged LHS) General Arrangement – SW Drawing No. JN.900002.0E3231 & Portrait (Hinged RHS) General Arrangement – SW Drawing No. JN.900002.0E3251. Both drawings are available in the DDM.

F3.3.12.5.8 The Developer, in accordance with BS EN ISO 12100 shall assess the requirement for emergency stop equipment. Measures taken shall be justified by risk assessment of the hazards involved and recorded.

F3.3.12.5.9 Typical Installation – the following guidelines for submersible pumps lay down the minimum standards to which the Developer shall work when considering the use of emergency stop devices. They form the basis of the risk assessment which is the responsibility of the designer:-

a. Under normal circumstances there should be no requirement for an emergency stop
b. Electrical supply must be isolated and locked off at the isolator before the pump is lifted
c. Where the pump does not self-correct rotation, then the pump rotational checks shall normally be carried out from the pump starter control panel

F3.3.12.5.10 Where fitted, emergency stop devices if required shall override all controls whatever their function and cut off the power supply to the drive. The device shall comply with BS EN ISO 13850 and shall be of the mushroom headed stay put type with break before latch mechanism, and twist or pull to release. Release of the mechanical latch shall not permit the plant to restart without appropriate resetting at the controlling Assembly

F3.3.12.6 Common Control Section

F3.3.12.6.1d The Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel shall utilise a back-up float switch system. The back-up float switch shall operate as outlined in MED 4417 (Control of Pumps).

F3.3.12.6.3 The Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel shall utilise an ultrasonic level controller and a back-up float switch system. The control of the Wastewater

Pumping Station (WPS) shall be in accordance with MED 4417 (Control of Pumps).

F3.4 Pumping Station Electrical Installation

F3.4.1 Electrical Components and Equipment (excluding the electrical assembly and cables)

F3.4.1.2 Socket Outlet

F3.4.1.2.1 A 13A, 230V, RCD protected socket outlet shall be mounted on the control panel, as per Wastewater Pumping Station (WPS) Standard Panel Drawings (SPD) Design B 2 Pump Control Panel and Design C 2 Pump VSD Control Panel– Portrait (Hinged LHS) General Arrangement – SW Drawing No. JN.900002.0E3231 & Portrait (Hinged RHS) General Arrangement – SW Drawing No. JN.900002.0E3251. All drawings are available in the DDM.

F3.4.1.3 Luminaries

F3.4.1.3.3 All kiosks shall be provided with internal lighting. This lighting shall be provided in accordance with the Form 2 Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel, the Design C 2 Pump VSD Control Panel and the Form 4 Wastewater Pumping Station (WPS) Standard 2 Pump Panel.

F3.4.1.3.4 For Type 1, 2 and 3 Wastewater Pumping Stations (WPS) which are a standard design and contain a kiosk, wet well and valve chamber an external light shall only be provided on the outside of the kiosk. This external light shall be operated from a switch on the inside of the kiosk. A suitable 230/110V (55-0-55v) transformer and associated socket outlet shall be provided in the kiosk to permit the connection of portable lighting to permit maintenance tasks associated for the WPS. The transformer and socket outlet shall be provided in accordance with MED 4001.

F3.4.1.3.5 For all other WPS permanent external lighting shall be installed. This lighting shall cover the external working areas for the pumps /motor drives and all instrumentation (including wet wells). An illumination level of 100 LUX and a CIE Colour Rendering Index of 2 shall be achieved at the relevant working locations. Special care shall be taken to prevent stroboscopic effects. The internal and external lighting shall be controlled from a single switch located within the Kiosk. This is to ensure that it is obvious that the lighting is on and needs to be switched off before personnel leave the site. All lighting and luminaries shall be provided in accordance with MED 4318 and WIMES 3.02.

F3.4.1.4 Anti-Condensation Heaters

F3.4.1.4.1 Kiosk heating shall be provided for kiosks containing the Form 2 Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel, the Design C 2 Pump VSD Control Panel and the Form 4 Wastewater Pumping Station (WPS) Standard 2 Pump Panel. The heaters shall be suitably rated, tubular, anti-condensation heaters, controlled tamperproof thermostats.

F3.4.1.5 Junction Boxes

F3.4.1.5.7 The normal connection arrangement for pump flexible cables (power & protection, not instrumentation) shall be a separate weatherproof junction box (IP 65 minimum) per pump unit, outside the well, suitable for the hazardous

area classification of the area. Cables shall be suitably glanded at the junction box. Disconnection of cables from the junction box shall be possible without entry into the wet well or valve chamber. The junction box shall be at waist height and associated supports shall not obstruct removal of the pump or cause a trip hazard. Junction boxes with doors shall be triangular key lockable, and all junction boxes shall have a label permanently fixed stating:

DANGER – LIVE TERMINALS
Do not test from this point

Voltage bands shall be segregated. Ultrasonic level sensor and float switch cables shall be cabled directly to the electrical assembly. Marshalling of cable terminations shall be logical from each duct.

F3.4.4 Installation of Cables

F3.4.4.13 Cable ducts from the junction box to the control panel shall be sealed at both ends against moisture and explosive/corrosive gas. The type of sealing system used shall be suitable for the assessed risk, prevent the migration of gases and be compliant with WIMES 3.02. Expanding foam shall not be used.

F3.4.4.16 If the installation is a pumping station not located in a secure compound, to mitigate risk of damage/vandalism each pump unit cable shall be directly cabled to the control panel kiosk via the duct provided. Ducts direct from the wet well shall be sealed against moisture and explosive/corrosive gas at the control panel end. If the wet well is designated as a hazardous area, a label shall be fixed adjacent to the duct(s) at the control panel end as follows:

HAZARDOUS AREA DUCT
Duct Sealing System to be retained at all times

A means of retaining the seal shall be provided for when cables are removed.

F3.6 Telemetry Outstation

F3.6.1b The telemetry outstations shall be provided in accordance with MED 4408 (Telemetry)

- Wastewater Pumping Station (WPS) Design B 2 Pump Control Panel – Servelec Systems S2000 micro or S2000. The telemetry outstation shall be mounted on the control panel as per the Wastewater Pumping Station (WPS) Standard Panel Drawings (SPD) Design B 2 Pump Control Panel – Portrait (Hinged LHS) General Arrangement – SW Drawing No. JN.900002.0E3231 & Portrait (Hinged RHS) General Arrangement – SW Drawing No. JN.900002.0E3251

- Wastewater Pumping Station (WPS) Design C 2 Pump VSD Control Panel - Servelec Systems S2000 micro or S2000. The telemetry outstation shall be wall mounted within as per the Wastewater Pumping Station (WPS) Standard Panel Drawings (SPD) Design C 2 Pump VSD Control Panel – Portrait (Hinged LHS) General Arrangement – SW Drawing No. JN.900002.0E3231 & Portrait (Hinged RHS) General Arrangement – SW Drawing No. JN.900002.0E3251

- Wastewater Pumping Station (WPS) Standard 2 Pump Panel (Form 4) F4.1 Gate (Sluice) Valves

F4 VALVE SPECIFICATION

F4.1 Gate (Sluice) Valves

F4.1.4 Valves shall additionally comply with the following:

- O-ring sealed
- Resilient seated
- Stainless steel shafts and fasteners
- Paint spec to WIMES 4.01
- Suitable for long periods (> 12 months) of idleness without seizing
- Marked with direction of closure
- Individually tightness tested in accordance with BS EN 12266-1

F4.2 Check (Reflux) Valves

F4.2.4 Add sentence: 'The half-inch BSP plugged tappings shall be fitted with stainless steel quarter-turn ball valves.'

F4.2.5 Valves shall additionally comply with the following:

- O-ring sealed
- Stainless steel shafts and fasteners
- Paint spec to WIMES 4.01

F4.4 Miscellaneous

F4.4.1 Add sentence: 'The half-inch BSP plugged tappings shall be installed on the horizontal centreline and fitted with stainless steel quarter-turn ball valves.'

F4.5 Isolation

F4.5.1 For the purposes of Baseline Mechanical Isolation (in accordance with HSG 253 Safe Isolation of Plant and Equipment), the following shall be applied to achieve Proved Isolation of the Single Block and Bleed:

- NRV: Downstream isolation valve fitted and Bleed (test point) fitted to downstream part of NRV.
- Pumps: Downstream isolation valve fitted and Bleed (test point) fitted to downstream part of NRV. Note pumps and associated pipework are self-draining.
- Rising main, common manifold and flowmeter (where fitted): Drained through Bauer connection and Bleed (test point) fitted to common manifold.
- Wet well: Upstream isolation valve/penstock with Bleed via visual leakage into wet well. Final Isolation by temporary means as per task specific risk assessment.

APPENDIX VII ASSOCIATED SOUTHERN WATER STANDARDS

Undertaker's Documents

These documents are available from the Undertaker's Policies & Standards Team, via Developer Services Team

TSM	Technical Specifications Manual
DDM	Design Drawing Manual
COM	Commissioning Manual
WOM	Works Operation & Maintenance ManualSECSecurity Manual
MED 4001	Mechanical and Electrical General Specification
MED 4004	Hazardous Area Classification
MED 4008	Chemical Dosing Equipment
MED 4100	Valves
MED 4142	Micro Pumping Stations
MED 4301	Package Plant and Control Panels rated up to 100 Amps
MED 4318	Lighting
MED 4417	Control of Pumps
MED 4433	Liquid Level Measurement
CED 4002	General Design Requirements
CED 4008	Fencing and Security
CED 4009	Roads, Surface Drainage, Footpaths & Landscaping
CED 4010	Pressure Pipelines and Rising Mains
CED 4019	Fibre Reinforced Plastic Kiosks
CED 4023	CESWI Amended and Supplementary Clauses
M&E 3015	Procedure for Inspection of Lifting Equipment
SEC250	Technical Standard Physical Security Policy
SEC250a	Security Concept Policy CAT3 Assets
RD.000000.0Z3931	Micro Pumping Station
JN.900003.0P0008	P&ID Developer Services Pumping Station
A81945.1001	Precast Concrete Man Entry Chamber <3.0m
A81945.1002	Precast Concrete Man Entry Chamber >3.0m

External Documents

WIMES 3.02	Low Voltage Electrical Installations
WIMES 4.01	Paint & Polymetric Coating's
BS EN 1990	Basis of structural and geotechnical design
BS EN 12050	Wastewater lifting plants for buildings and sites - Non-return valves for faecal-free wastewater and wastewater containing faecal matter
BS EN 12266-1	Industrial valves. Testing of metallic valves - Pressure tests, test procedures and acceptance criteria. Mandatory requirements
BS EN 12566	Small wastewater treatment systems for up to 50 PT - Prefabricated tertiary treatment units
BS EN 50160	Voltage characteristics of electricity supplied by public electricity networks
BS EN 60034-1	Rotating electrical machines - Rating and performance
BS EN 60079	Explosive atmospheres
BS EN 60085	Electrical insulation. Thermal evaluation and designation
BS EN 61508	Functional safety of electrical/electronic/ programmable electronic safety-related systems
BS EN 61511	Functional safety. Safety instrumented systems for the process industry sector
BS EN 80079-36	Explosive atmospheres - Non-electrical equipment for explosive atmospheres. Basic method and requirement
BS EN ISO 9223	Corrosion of metals and alloys. Corrosivity of atmospheres. Classification, determination and estimation
BS EN ISO 12100	Safety of machinery. General principles for design. Risk assessment and risk reduction
BS EN ISO 12944-2	Paints and varnishes. Corrosion protection of steel structures by protective paint systems - Classification of environments
BS EN ISO 13850	Safety of machinery. Emergency stop function. Principles for design

7. DETAILS OF CHANGE HISTORY

Issue 6

Section No.	Paragraph No.	Change	Rational for Change
-	-	Significant Update	Feedback from Developer Services

G. J. Mullett

Authorised By…… Gregory Mullett

Signature