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Wastewater Pumping Stations (WWPS) Technical Addendum

Technical Addendum Number: HWC TA WWPS-01 – Revision 1

HW2009-2368/1/4.002

Background

Following a review of existing Standard Construction Practice (SCP) drawings and associated design specifications this technical addendum seeks to clarify Hunter Water's current requirements for the design and construction of wastewater pumping stations.

This addendum should be read in conjunction with STS 402 *Construction of Submersible Sewerage Pumping Stations* and STS 403 *Construction of Sewer Rising Mains*, as well as Design Manual 4 *Small to Medium Submersible Sewage Pumping Stations and Sewer Rising Mains.*

In addition, Hunter Water is currently participating in WSAA's review of WSA04 2017 V3.1 Sewage Pumping Station Code of Australia and it anticipated that outcomes from this review will be considered for adoption during 2017.

Changes to the Hunter Water Standards

1 Standard Drawings (Modified)

Hunter Water has re-introduced a set of standard drawings, including some new additional Standard Drawings. These drawings take precedent over the equivalent Standard Drawings provided in the Hunter Water Design Manual 4, Hunter Water edition of the WSAA Sewerage Code and associated technical specifications (STS 402 and STS 403).

The following table summarises the drawings that have been re-introduced.

Drawing	Revision	Name	Comments
SCP 600	3	Sewer Pumping Stations Circular Valve Pit Covers Marking Plan	Valve pit beam, locking box and pit covers position changed to suit ladder position. Permanent marking requirements changed.
SCP 601	3	Sewer Pumping Stations Circular Valve Pit Covers Cover Plate Details	Valve pit covers position changed to suit ladder position. Permanent marking requirements changed.
SCP 602	2	Sewer Pumping Stations Circular Valve Pit Covers Beams and Bracket Details	Title block updated.
SCP 603	4	Sewer Pumping Stations Rectangular Valve Pit Covers Marking Plan	Permanent marking requirements changed. Title block updated.
SCP 604	4	Sewer Pumping Stations Rectangular Valve Pit Covers Cover Plate Details	Permanent marking requirements changed. Title block updated.
SCP 605	2	Sewer Pumping Stations Rectangular Valve Pit Covers Beams and Locking Bracket	Addition of valve spindle support guide.
SCP 700	1	Sewer Pumping Stations DN 1800 to 3000 Duplex SPS Concrete Roof Slab Plan	Addition of connection box. Switchboard made perpendicular to slab. Overall roof slab dimensions modified.
SCP 701	1	Sewer Pumping Stations DN 1800 to 3000 Duplex SPS Concrete Roof Slab Sections	Switchboard concrete plinth removed. Overall roof slab dimensions modified. Induct vent modified.
SCP 704	-	Sewer Pumping Stations DN 3800m Duplex SPS (Small Cubicle) Concrete Roof Slab - Plan	Removed
SCP 705	-	Sewer Pumping Stations DN 3800m Duplex SPS (Small Cubicle) Concrete Roof Slab - Sections	Removed

SCP 708	1	Sewer Pumping Stations DN 3800m Duplex SPS Concrete Roof Slab - Plan	Addition of connection box. Switchboard made perpendicular to slab. Overall roof slab dimensions modified.
SCP 709	1	Sewer Pumping Stations DN 3800m Duplex SPS Concrete Roof Slab - Section	Switchboard concrete plinth removed. Overall roof slab dimensions modified. Induct vents modified.
SCP 710	1	Sewer Pumping Stations DN 4600 Duplex SPS Concrete Roof Slab Plan	Addition of connection box. Switchboard made perpendicular to slab. Overall roof slab dimensions modified.
SCP 711	1	Sewer Pumping Stations DN 4600 Duplex SPS Concrete Roof Slab Sections	Switchboard concrete plinth removed. Overall roof slab dimensions modified. Induct vents modified.
SCP 800	2	Sewage Pumping Stations Single Sliding Hatch Covers Marking Plans and Details	Safety screens removed. Permanent marking requirements changed. Sliding cover handle modified.
SCP 801	2	Sewer Pumping Stations Single Sliding Hatch Covers Hatch Cover Details	Permanent marking requirements changed. Sliding cover handle modified.
SCP 802	1	Sewer Pumping Stations Single Sliding Hatch Covers Door Stop and Screen Support Details	Safety screens removed.
SCP 803	2	Sewer Pumping Stations Double Sliding Hatch Covers Marking Plan and Details	Safety screens removed. Permanent marking requirements changed. Sliding cover handle modified.
SCP 804	2	Sewer Pumping Stations Double Sliding Hatch Covers Hatch Cover Details	Section C; replaced 110 with 160. Note change. Permanent marking requirements changed. Sliding cover handle modified.
SCP 805	-	Sewer Pumping Stations Double Sliding Hatch Covers Door Stop and Screen Support Details	Removed
SCP 810	1	Sewer Pumping Station Gas-Tight Wet-Well Covers - General Arrangement (Plan)	Safety screens removed. Permanent marking requirements changed. Hinge restraint added.
SCP 811	1	Sewer Pumping Station Gas-Tight Wet-Well Covers - General Arrangement (Elevation)	Safety screens removed. Epoxy Sealant at Detail 1. Addition of Note 3. Hinge restraint added.
SCP 812	1	Sewer Pumping Station Gas-Tight Wet-Well Covers - Steel Works (Frame)	Frame opening dimension increased.
SCP 813	1	Sewer Pumping Station Gas-Tight Wet-Well Covers - Steel Works (Frame)	Addition of Notes.

SCP 814	1	Sewer Pumping Station Gas-Tight Wet-Well Covers - Steel Works (Cover)	Hinge moved closer to slab. Addition of Note 5. Hinge restraint added.
SCP 815	-	Sewer Pumping Station Gas-Tight Wet-Well Covers - Steel Works (Safety Mesh)	Removed
SCP 900	1	Sewer Pumping Stations DN 1800 to 3000 Precast Type Pump Well Details	Concrete hob removed from wet-well opening. Hob still required for sliding cover arrangement.
SCP 901	2	Sewer Pumping Stations Blockout and Puddle Flange Detail	Line weightings modified.
SCP 902	1	Sewer Pumping Stations Drop Tubes and Pipe Clips	Line weightings modified.
SCP 903	1	Sewer Pumping Stations Benching Details Without Baffle Wall	Line weightings modified.
SCP 904	1	Sewer Pumping Stations Benching Details With Baffle Wall	Line weightings modified.
SCP 905	1	Sewer Pumping Stations Induct Vent Pipe Clip	Line weightings modified.
SCP 906	1	Sewer Pumping Stations Cable Holder and Chain Hook Details	Remove fillets from hatch opening arrangement. Remove screen supports. Change position of hooks and cable holders. Safety Screens removed.
SCP 907	1	Sewer Pumping Stations Cable Trench Covers	Addition of cable trench cover locking system.
SCP 908	1	Sewer Pumping Stations Concrete Supports for Stop Valves and Reflux Valves	Line weightings modified.
SCP 909	2	Sewer Pumping Stations Valve Pits Ladder Details	Monorail ladder removed. New ladder design.
SCP 910	1	Sewer Pumping Stations Induct Vent Details	Addition of induct vent cover. Replaced induct vent type.
SCP 911	1	Sewer Pumping Stations Water Service Details	Line weightings modified. Addition of vandal proof tap.
SCP 912	0	Sewer Pumping Stations Typical Pipework Arrangement and Details	Changes to typical pipework arrangement and details. Inclusion of station by-pass. Inclusion of rising main scour line.
SCP 923	0	Typical Electrical Installation Details	Removed
SCP 1002	1	Discharge Access Chambers For Sewer Rising Mains Up to DN500	Addition of Notes.

2 Standard Drawings (*New and Additional*)

Hunter Water has introduced the following ***new and additional*** standard drawings to the standard requirements for wastewater pumping stations (STS 402, STS 403, and Hunter Water Design Manual 4)

Drawing	Revision	Name
SCP 606	0	General Arrangement
SCP 702	0	Sewer Pumping Stations Roof Slab Reinforcement Sections
SCP 820	0	WWPS Fall Prevention Handrail - Sliding Covers
SCP 821	0	WWPS Fall Prevention Handrail - Hinged Covers
SCP 822	0	WWPS Fall Prevention Handrail - Sliding Covers
SCP 823	0	WWPS Fall Prevention Handrail - Hinged Covers Latch Detail
SCP 913	0	Sewer Pumping Stations Typical Pipework Arrangement and Details

3 Design Requirements

Other Wastewater Pumping Station Technical Addendum changes being applied to Design Manual 4 and Standard Technical Specifications (STS 402 and STS 403) are as follows:

3.1 Safety in Design

Designs must meet the requirements of:

- *Work Health and Safety Act, NSW, 2011 (WHS Act)*
- *Work Health and Safety Regulation, NSW, 2011 (WHS Regulation)*

The design process and outputs shall comply with requirements detailed in the *CHAIR Safety in Design Tool, NSW, 2001, (www.workcover.nsw.gov.au).* Outputs from the CHAIR sessions shall be addressed and incorporated into the design. Copies of the minutes of CHAIR meetings are to be made available to Hunter Water if requested.

3.2 Emergency Storage

Pumping station failure may occur for a number of reasons including:

- Loss of power supply;
- Switchboard failure;
- Pump failure;
- Pumping station pipework issues; or
- Rising main issues.

Emergency storage shall be provided to allow Hunter Water sufficient time to respond to failures and to mitigate the potential for overflow to occur. Emergency storage is considered to include both wet well storage and storage in upstream gravity sewers. Emergency storage requirements for new and existing pumping stations are discussed as follows:

3.2.1 New Pumping Stations

For new pumping stations:

- A minimum of 4 hours storage of ADWF from the gravity catchment and 3 minutes of pumped duty flow from upstream stations shall be provided between High Level Alarm Level and overflow level.
- Systems draining to waters deemed sensitive by Hunter Water (e.g.: Hunter Water Special Catchment Areas, waters near oyster leases) require 8 hours storage of ADWF from the gravity catchment and 3 minutes of pumped flow from upstream stations.

Consult with Hunter Water to confirm emergency storage requirements prior to commencing concept design.

3.3 Emergency Relief Structures (ERS)

In most cases new pumping stations require the design and construction of an emergency relief structure. To facilitate approval, the pumping station concept design report must include sufficient information for Hunter Water to complete an assessment of whether an emergency relief structure is essential for the proper and efficient operation of the wastewater system. At minimum, the assessment must address the following:

The location of overflows with and without a directed overflow structure;

- The risk of harm to public health, environment or property if the proposed directed overflow structure is not constructed;
- The risk of harm to public health and the receiving environment if an overflow from the directed overflow structure occurred;
- The systems to be used to monitor overflows, power failures or mechanical failures of pumping or electrical equipment relating to or affecting the proposed directed overflow structure (consult with Hunter Water);
- Details of the proposed methodology for responding to overflows (consult with Hunter Water).

The assessment must be considered in the project Review of Environmental Factors (REF) or any other process used to obtain planning approval for the works. The assessment may also be used by Hunter Water as part of the licensing application process undertaken with the NSW Environment Protection Authority (EPA)

Design drawings of Hunter Water's Standard Flow Relief Structures are contained within the Hunter Water WSA 02 code.

The storage volume between Flood Alarm Level and Overflow Level is to be provided at both initial and ultimate stages to ensure available storage time as required by Hunter Water, where applicable.

Preferable, the ERS shall overflow from the inlet MH wherever practicable. Alternatively, the ERS may flow from the emergency storage (Refer to *Standard Drawing SEW-1412*). The ERS shall incorporate an overflow pipe, a weir point, and baffle arrangement and be designed to retain gross solids/trash, scum and gas within the sewer system.

The emergency relief weir shall be located to provide the maximum storage time prior to overflow whilst also ensuring that the emergency relief operates before surcharge occurs elsewhere in the system. Where the weir is formed by the outlet (invert) of a rising pipe, it shall be fitted with a gas check/flap.

The overflow pipe shall be designed with cover requirements as specified for sewers (Refer to *WSA 02*) and, in order of preference, shall discharge to Hunter Water's nominated discharge point such as:

1. An adjacent sewer catchment.
2. A formed stormwater drain e.g. pipe, channel etc.
3. An unformed drain, creek or watercourse.
4. A harbour or river.
5. Tidal waters.

For sewers up to and including DN300, the overflow pipes shall preferably be one size larger than the sewer with a minimum size of DN225.

For sewers DN375, where the length of the overflow pipes does not exceed 30 m, an overflow pipe DN375 may be used.

For all other cases a special design is required.

The overflow pipe shall also satisfy the following conditions:

1. The outlet of an overflow pipe shall be made at an angle of between 45°and 90° to the direction of flow in the channel or watercourse to which it discharges.
2. Where discharge is a formed channel, the invert of the overflow pipe outlet shall not be lower than 0.15 m above the toe of the channel wall.
3. Where discharge is to a pipe drain, the overflow pipe outlet shall, if practicable, be designed centre to centre with the stormwater pipe. Where this is not practicable, the design shall ensure the structural integrity of the stormwater pipe will be preserved.
4. Access chambers shall be used at changes in direction of overflow lines.
5. Sewer overflows minimum grade for is 1.0%.
6. Approval of the relevant owner or authority responsible for the adjacent sewer catchment or drain for discharge and connection details is required.
7. Discharge into a natural waterway an unformed drain, creek, river, harbour or estuary must be considered within the planning approval process (normally the REF) and all relevant government agencies with a responsibility for the waterway consulted.

8. The overflow level shall be located as high as practicable within the constraints set out below, to provide relief. It shall be at a level that will allow the overflow to operate before discharge occurs from upstream house fittings or upstream access chambers. It shall also satisfy the following conditions:

    a. Be not lower than the mid-height of the receiving stormwater drain or waterway at the point of connection.

    b. Be not lower than 0.5 d above the soffit level of the outlet sewer (where d is the diameter of the outlet sewer).

    c. Be not lower than maximum tidal level.

Standard Drawing SEW–1412 shows typical ERS arrangements and may be used in developing a design. Alternatively, use of a commercial overflow structure may be appropriate in some situations. Hunter Water approval is required for the final design.

3.4 Fatigue de-rating for rising main pipes

Where plastic pipe (including PVC, PE or GRP) is to be used for sewer rising mains, the selection of the pipe material and class shall take into account the potential for fatigue resulting from dynamic pressure loading from pump starts.

The de-rated fatigue capacity of the pipe is based on the number of pump cycles and shall be calculated and applied in accordance *WSA 03*.

Table 1: Methods for Design of Plastic Pipes and Fittings for Dynamic Stresses (Adopted from Table 3.3 of WSA 03-2010, Section 3.1)

Pipe Line System	PIPA Guidelines
PVC pressure pipes	POP101 Issue 1.3 - PVC pressure pipes design for dynamic stresses
PE pressure pipes	POP010A Issue 5.1 – Part 1: Polyethylene pressure pipes design for dynamic stresses
PE fusion fittings	POP010B issue 5.1 - Part 2: Fusion fittings for use with polyethylene pressure pipes design for dynamic stresses
GRP pipes and fittings	There is limited data to detail the design of GRP pipes and fittings. The performance of GRP pressure pipes and fittings subjected to systemic fatigue is dependent on the integrity of the manufacturing process, particularly for fittings. Fatigue design of GRP pipes and fittings requires Hunter Water authorisation with appropriate specialist input. The design must be objectively certified with reference to testing and validation of criteria documented by the manufacturer. Specification of ductile iron fittings in lieu of GRP fittings should be considered for applications subjected to significant fatigue loadings.

NOTES:
1 PIPA Guidelines are available from www.pipa.com.au
2 Where fittings are required for PVC pipelines, they shall be ductile iron.

3.5 Wet Well opening size

The opening size of pumping station wet wells shall be designed for the largest approved pumps for the ultimate flow requirements.

3.6 Electrical switchboard (minimum clearances)

There shall be a minimum clearance of 600mm from the open outer edge of the switchboard door to any other structure to allow for safe egress from the switchboard.

3.7 Wet Well and Pit Covers

Hunter Water approves the use of standard designs for stainless steel and aluminium covers for the pumping well and valve pit.

- Hinged “Gas-Tight” or sliding aluminium covers shall be used for pumping station wet well roof openings.
- Gatic covers shall not be used for the wet wells.
- Refer to Hunter Water’s Standard Drawings available at www.hunterwater.com.au

Where changes to standard cover designs are required, the design is to undertake a operation and maintenance risk assessment to ensure final arrangement is fit for purpose. As a minimum the vertical lift weight must not exceed 20kg for any lifted or hinged cover.

3.8 Access Roads and Hardstand Area

3.8.1 General

Access roads to the pumping station and the standing area at the site must be designed for all vehicle types required for the site during, construction, operation and maintenance, including:

- Mobile lifting equipment,
- Maintenance vehicles and
- Tankers
- Generator delivery truck (Tilt truck or side loader)
- Generator laydown area adjacent to generator connection point.

3.8.2 Design of Access Roads

Design access roads in accordance with the Roads and Maritime Services (RMS) Road Design Reference Documents (www.rms.nsw.gov.au). Notwithstanding the requirements of the Road Design Reference Documents, minimum requirements include:

- Access roads and hardstand / turning areas and shall be designed to accommodate a 25kL articulated tanker.
- Road base for access roads shall be a minimum thickness of 200 mm.
- Access roads with grades steeper than 10 % and all hardstand areas shall be sealed with one of the following:
    - 2 coat bitumen seal,
    - 25 mm asphalt, or
    - Reinforced concrete
- All vehicle turning areas shall be reinforced concrete.
- Roads shall be all weather and suitable for heavy vehicles.

3.8.3 Access and Turning Areas

Vehicle turning areas shall be provided where necessary to minimise risks from any traffic hazards caused by vehicles entering and leaving the site. In general terms, vehicle turning areas are required where either:

- The pumping station does not front an adjacent roadway, or,
- The adjacent roadway is a main road.

Hunter Water and the relevant local council shall be consulted in determining requirements for access.
The design will include one plan view showing vehicular access and turning circles of all vehicle types expected to be required at the facility.

3.9 Landscaping

The remainder of site, including all cut and fill batters and any surface table drains, shall be topsoiled and turfed.

The design will include a landscape plan which will identify landscaping of the site to improve visual amenity. The landscape plan is required to be submitted for assessment under the planning approval process.

The landscaping plans shall consider issues such as the conservation of visual amenity, screening, noise reduction, access improvement and constraints, stabilisation of site, elimination of soil erosion risk, contribution to bushfire risk if applicable, and appropriate vegetation.

Approved landscaping plans will be incorporated into the construction environment management plan (CEMP) prepared for construction works.

Where possible, cut and fill will be designed to minimise removal of material from the site.

3.10 Pipeline Crossings

Pipeline crossings of roads, railway lines, creeks and underground services shall be designed as per water main design criteria detailed in WSA03 – 2010 Hunter Water Edition.

3.11 Protection of Concrete Structures

Provide a protective coating system for the following concrete structures:

- All cast in situ wet well concrete.
- Pre-cast wet well structures or components exposed to septic conditions at any stage of the stations design life.
- Concrete emergency storage structures.
- Discharge maintenance holes and all concrete structures 100m downstream of discharge points.
- Collecting maintenance holes exposed or likely to be exposed to septic sewage.
- Maintenance holes that receive other pumped wastewater flows, such as from pressure sewer systems, common effluent pumping systems or pump to sewer systems >1ET.

Extend protective coating to the benching of wet wells and the low flow level for in-line wastewater structures. Coat all surfaces for off-line wastewater structures.

Protective surface coatings shall comply with WSA 201 – 2013-1.1 *Manual for Selection and Application of Protective Coatings* and Sydney Water's Supplement to WSA 201.

The protective coating system selected is to be suitable for an extreme exposure classification defined within WSA 201 – 2013 and the specific requirements of the project.

3.12 Operation and Maintenance Manuals

- STS 906 *Operation and Maintenance Manual Requirements* outlines Hunter Water's operation and maintenance manuals requirements for the pumping station designer and constructor.
- STS 906 shall be adhered to for all wastewater pumping stations and replaces section 23 of STS 402.

Further Information

This revision of the Wastewater Pumping Station Technical Addendum will take immediate effect on:

- All Hunter Water Capital Works sewerage projects currently under concept and detail design phase.
- All Developer funded sewerage projects currently under concept and detail design phase.

If you have any further enquiries or suggestions regarding any of the information outlined in this Technical Addendum, please e-mail standards@hunterwater.com.au