

NEW SOUTH WALES

DEVELOPMENT DESIGN SPECIFICATION

D12

SEWERAGE SYSTEM

AUS-SPEC appreciates the role of the NSW Water Directorate in comprehensively updating the design and construction specifications for water and sewer works.

INSTRUCTION FOR SPECIFICATION PREPARATION
(Delete this box before printing)

LOCAL REQUIREMENTS FOR SEWER RETICULATION DESIGN

1. This Specification recognises that each Council may need to vary the Specifications to meet local requirements. The items below may be taken into account in varying this design specification and the construction specification C402.
2. The Water Directorate, a division of the Institute of Public Works Engineering, may provide additional information regarding the following:
 - a) A complete list of Australian Standards relevant to Water Reticulation compiled as a result of a survey of Standards in use.
 - b) A schedule of training organisations available to provide accreditation to Contractors and Superintendents.
 - c) A schedule of products in use compiled as a result of a survey of users.
 - d) Advice on handling different requirements between the Council and any subsidising Authority. Differences identified include:
 - i. Provision of more expensive materials, fittings and pumps.
 - ii. Automation (eg Sewerage pump station well washers and flushing valves D12.21.1).
 - iii. Depth of gravity sewers versus increased number of pump stations.
 - iv. Dimensional variations, including:
 1. Sewer maintenance hole spacing (D12.08.1).
 2. Length of sewer dead ends (D12.08.2).
 3. Length of sewer service connections (D12.10.8).
 4. Cover requirements (C402.16).
 5. Depth to sewer connections (D12.05.2, D12.10.9).
3. The grading requirements called up for sand bedding may need to be checked where Council wishes to facilitate local acquisition. (C402.23.2, Table C402.3).
4. Valve opening direction varies within and between Water Authorities. The requirements of the specifications may need to be checked against existing installations. (C402.56.4).
5. The requirement for the location of property services varies between Councils. The requirements of the specifications may need to be checked against existing installations. (C402.26.2).
6. The number and timing for receipt of documents called up varies between Councils. The requirements of the specifications may need to be checked against existing requirements.
7. Councils require varying lead times for notices to be given. The requirements of the specifications may need to be checked against existing requirements.

8. Council may wish to consider the option for installation of curved pipes (eg in cul-de-sacs).
9. Council may wish to include provision for inverted syphons and associated venting.

AUS-SPEC #1

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
<i>EXAMPLE 1</i>	<i>Provision for acceptance of nonconformance with deduction in Payment</i>	<i>XYZ.00</i>	<i>AP</i>	<i>KP</i>	<i>2/6/97</i>

DEVELOPMENT DESIGN SPECIFICATION D12 - SEWERAGE SYSTEM

GENERAL

D12.01 SCOPE

1. The work to be executed under this Specification consists of the design of a sewerage system either as a stand-alone project or part of a development. **Design**
2. The Specification contains procedures for the design of the following elements of the sewerage system: **Elements**
 - (a) Gravity sewers including junctions and property connection sewers.
 - (b) Common effluent sewers both gravity and pressurised.
 - (c) Vacuum sewer system.
 - (d) Maintenance holes and other structures.
 - (e) Rising mains.
 - (f) Pump stations.
3. The design of gravity sewer systems and pump station components shall comply with the Water Services Association of Australia's publication SEWERAGE CODE OF AUSTRALIA unless specified otherwise herein and should be constructed in accordance with the DEVELOPMENT CONSTRUCTION SPECIFICATION - SEWERAGE SYSTEM. **Compliance**
4. Where the Specification forms part of a contract attracting Government Grant funds, the Principal shall identify **Subsidised Schemes**
 - (a) Items which are not of the least cost option, that
 - (i) Are intended to have a much longer design life than the normal asset service life detailed in the Asset Management Guidelines of the International Infrastructure Management Manual.
 - (ii) Do not meet the project objectives and the requirements of the various Authorities for the least Net Present Value (NPV) but may become the preferred option for construction.
 - (b) Particular equipment which is procured without relevant competition through tendering
 - (c) Duplication of equipment or unit processes in a system configuration

D12.02 OBJECTIVE

1. The objective of the sewerage system is to transport sewage or effluent from domestic properties to the treatment plant in accordance with all current relevant legislation. Consumer requirements shall be met by providing a sewer main and allowing an appropriate point of connection for each individual property. **Sewerage System**

D12.03 REFERENCE AND SOURCE DOCUMENTS

1. Documents referenced in this Specification are listed below whilst being cited in **Documents**

the text in the abbreviated form or code indicated. The Designer shall possess, or have access to, the documents required to comply with this Specification.

2. References to the SEWERAGE CODE OF AUSTRALIA are made where there are parallel sections or equivalent clauses to those in this Specification. Where not called up as part of this Specification, these references are identified by part and section numbers and enclosed in brackets thus (WSA Part, Section).

Sewerage Code

(a) Council Specifications

C402 - Development Construction Specification Sewerage System.

The Designer shall include the requirements of the DEVELOPMENT CONSTRUCTION SPECIFICATION - SEWERAGE SYSTEM.

(b) Australian Standards

Australian Standards

References in this Specification or the Drawings to Australian Standards are noted by their prefix AS or AS/NZS. (WSA 02 Part 1 section 1.3).

The Designer shall use the latest edition of the Australian Standards including amendments and supplements, unless specified otherwise in this Specification.

- AS 1102 - Graphical symbols for electrotechnical documentation (various)
- AS 1214 - Hot dipped galvanised coatings on threaded fasteners (ISO metric coarse thread series)
- AS/NZS 1260 - PVC pipes and fittings for drain, waste and vent applications
- AS 1281 - Cement mortar lining of steel pipes and fittings.
- AS 1444 - Wrought alloy steels – Standard, hardenability (H) series and hardened and tempered to designated mechanical properties
- AS 1449 - Wrought alloy steels – Stainless and heat-resisting steel plate, sheet and strip
- AS/NZS 1477 - PVC pipes and fittings for pressure applications
- AS 1579 - Arc welded steel pipes and fittings for water and wastewater.
- AS/NZS 1594 - Hot rolled steel flat products
- AS 1631 - Cast grey and ductile iron non-pressure pipe and fittings
- AS 1646 - Elastomeric seals for waterworks purposes
- AS 1657 - Fixed Platforms, walkways, stairways and ladders – Design, construction and installation
- AS 1741 - Vitrified clay pipes and fittings with flexible joints - Sewer quality.
- AS 2129 - Flanges for pipes, valves and fittings
- AS 2200 - Design charts for water supply and sewerage
- AS/NZS 2280 - Ductile iron pressure pipes and fittings
- AS/NZS 2566.1 - Buried flexible pipelines – Structural design
- AS 2634 - Chemical plant equipment made from glass-fibre reinforced plastics (GRP) based on thermosetting resins
- AS 2837 - Wrought alloy steels – Stainless steel bars and semi-finished products
- AS 3500 - National Plumbing and Drainage Code
- AS 3518.1 - Acrylonitrile Butadiene Styrene (ABS) pipes and fittings for pressure applications – Pipes
- AS 3518.2 - Acrylonitrile Butadiene Styrene (ABS) pipes and fittings for pressure applications – Solvent cement fittings
- AS 3571 - Glass filament reinforced thermosetting plastics (GRP) pipes - Polyester based - Water supply, sewerage and drainage applications
- AS 3680 - Polyethylene sleeveings for ductile iron pipelines.
- AS 3735 - Concrete structures for retaining liquid
- AS 3862 - External fusion-bonded epoxy coating for steel pipes
- AS 3996 - Metal access covers, road grates and frames.

AS 4058	-	Precast concrete pipes (pressure and non pressure)
AS 4060	-	Loads on buried vitrified clay pipes.
AS 4087	-	Metallic flanges for waterworks purposes
AS 4100	-	Steel structures
AS/NZS 4129 (Int)		Fittings for polyethylene (PE) pipes for pressure applications.
AS/NZS 4130	-	Polyethylene (PE) pipes for pressure applications.
AS/NZS 4131	-	Polyethylene (PE) compounds for pressure pipes and fittings.
AS/NZS 4158	-	Thermal-bonded polymeric coatings on valves and fittings for water industry purposes
AS/NZS 4321	-	Fusion-bonded medium-density polyethylene coating and lining for pipes and fittings
AS/NZS 4765 (Int)		Modified PVC (PVC-M) pipes for pressure applications
HB48	-	Steel structures design handbook.

Where not otherwise specified in this document, the Contractor shall use the latest Australian Standard available within two weeks of close of tenders.

(c) Other

Institute of Public Works Engineering Australia (IPWEA)

- Streets Opening Conference Information Bulletin on Codes and Practices (Sections 3 and 4 detailing locations and depths of other services).

NSW Department of Public Works and Services (DPWS)

MEW E101	-	Electrical Services Minimum Requirements
PWD	-	Safety Guidelines for fixed ladders, stairways, platforms and walkways for use in sewage treatment Works, pumping stations and maintenance holes.
PWD-SD	-	Public Works Department Manual of Practice – Sewage Design.
PWD-PSD	-	Public Works Department Manual of Practice – Sewage Pumping Station Design (May 1986).
WS-SPEC	-	Technical Requirements (TRs) and Strategic products Specifications (WSAA)

Water Services Association of Australia (WSAA)

WSA 02	-	Sewerage Code of Australia
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Building Codes Board of Australia

- Building Code of Australia - PART E1, Fire Fighting Equipment.

European Standard.

BS EN 1091	-	Vacuum Sewerage Systems.
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(d) Standard Drawings

Drawings

SEWERAGE CODE OF AUSTRALIA drawings are to be used in preference to DPWS Standard Drawings (WSA 02 Part 3).

DESIGN CRITERIA

D12.04 GENERAL

1. The design shall be in accordance with the SEWERAGE CODE OF AUSTRALIA, or PWD-SD and PWD-PSD unless specified otherwise herein. (WSA 02 Part 1)

Standard

2. Except where specified otherwise, the division of responsibilities between the Sewer Authority and the Designer shall be in accordance with the SEWERAGE CODE OF

Responsibility

AUSTRALIA (WSA 02 Part 1, section 2.1).

3. The Designer shall confirm the design criteria with the Sewer Authority and shall design a gravity pipeline distribution system with pump stations and rising mains, where necessary to comply with the requirements of this Specification, to transport fresh sewage, or common effluent, for treatment.

**Gravity
System**

4. Pressurised common effluent or vacuum systems shall only be considered after consultation with the Sewer Authority. (WSA 02 Part 1, section 4).

**Pressurised or
Vacuum
System**

5. The Designer shall not provide for common effluent or vacuum discharges to gravity sewers or conventional wastewater treatment plants without the concurrence of the Sewer Authority.

**Discharges to
Gravity Sewers**

D12.05 DETERMINATION OF AREA TO BE SERVED

1. The area to be served shall be determined in accordance with PWD-SD except that the Sewer Authority may require provision for an upstream sewer. In the design brief the Sewer Authority will indicate the level and size of existing pipe as well as anticipated flows to be allowed for in the design. (WSA 02 Part 1, section 2).

**Upstream
Sewer**

2. The depth of sewer shall be sufficient to allow a minimum of 90 per cent of each lot to be serviced.

Depth

3. All lots shall be able to be served by gravity sewers wherever possible.

**Provision of
Sewerage**

D12.06 DESIGN LOADING

1. The Designer shall obtain the concurrence of the Sewer Authority for the flow to be used for the design of sewers serving industrial areas and developments not specifically listed in the SEWERAGE CODE OF AUSTRALIA or PWD-SD. (WSA 02 Part 1, section 2.3).

Flows

2. The design shall take account of AS 2200, AS/NZS 2566.1, AS 3500, AS 3735, the SEWERAGE CODE OF AUSTRALIA and, where design elements are not covered elsewhere in these codes, PWD-SD and PWD-PSD.

Design Codes

D12.07 SEWER ALIGNMENT (WSA 02 Part 1, section 2.5)

1. Where it is necessary for sewers to be located outside the development, the Designer shall obtain written approval from the affected property owner. Preparation of any application for approval from an affected property owner shall constitute a **WITNESS POINT**. The Principal shall advise whether the option to review and direct on the application is taken at the time of notification by the Designer.

**Consent of
Owner**

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2. Where sewers are proposed to be located within existing road reserves, the Designer shall check that the sewers do not conflict with other utility services and locate the sewers in accordance with established protocols. (WSA 02 Part 1, section 2.6)

Road Reserve

3. Sewers located on private property must be located in an easement of minimum width three (3) metres. Unless there are compelling reasons to the contrary the sewer shall be located in the centre of the easement. A Registered Surveyor shall survey easements and pipelines. (WSA 02 Part, section 2.7).

Easement

4. Where control of the trench width is practical or effective, the design may be based on wide trench condition. The Designer shall call up the need, in the Construction Specification, for the Contractor to supply special construction control with a method

Trench Width

statement when there is economic justification to design to narrow trench condition.

D12.08 MAINTENANCE HOLES (MHs) (WSA 02 Part 1, section 2.9)

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| 1. Maintenance holes shall generally be placed on gravity sewers as specified in PWD-SD Clause 6.1, except that the maximum spacing shall be 70m (WSA 02 Part 1, section 2.5.4). | Spacing |
| 2. All upstream ends of sewers shall terminate in a maintenance hole if the upstream end is more than 30 m from the down stream maintenance hole. | Terminal Maintenance Hole |
| 3. Step irons shall be provided to all maintenance holes where the depth from top of cover to the invert of the outlet pipe exceeds 1200mm. Step Irons shall be of 24mm diameter hot dip galvanised steel, cast aluminium or plastic encapsulated. | Step Irons |
| 4. The Designer shall provide for the venting of maintenance holes which accept pumped discharges. | Venting |
| 5. Connections to existing maintenance holes or sewers of the existing sewerage system is to be based on the Sewer Authority's sewerage master plan. | Connections to Existing Systems |
| 6. Metal access covers shall be manufactured in accordance with AS 3996. | Access Covers |

D12.09 MAINTENANCE SHAFTS (MSs) AND TERMINAL MAINTENANCE SHAFTS (TMSs)

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|---|---------------------------------------|
| 1. Maintenance shafts and terminal maintenance shafts shall be provided only as required by the Sewer Authority. | As Required by Sewer Authority |
| 2. The provision of maintenance shafts and terminal maintenance shafts shall not affect the layout of maintenance holes or terminal maintenance holes unless directed by the Sewer Authority. | MH Layout |
| 3. Where used, a terminal maintenance shaft shall be no further than 70m from the nearest maintenance hole. | Maximum Spacing |
| 4. The Designer shall take account of conditions limiting the use of maintenance shafts (WSA 02 Part 1, section 2.9.4.1) | Conditions Limiting Use |

D12.10 PIPELINE (WSA 02 Part 2)

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|---|-------------|
| 1. Pipes and fittings for sewerage systems shall be of unplasticised PVC, modified PVC, ductile iron, vitrified clay, steel, polyethylene or glass reinforced plastic. The material specifications for each pipe type are provided in Clauses D12.13 to D12.19 inclusive. | Type |
|---|-------------|

The choice of pipe type constitutes a **WITNESS POINT**. The Principal shall advise at the time of notification by the Designer whether the option to confer is required.

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| 2. Asbestos cement pipe and fittings shall not be used. | Asbestos Cement |
| 3. Concrete pipes shall not be used. | Concrete Pipes |
| 4. Pipelines shall be buried. Above ground sewers may be designed in a gravity | Buried Pipes |

system only where other options are less practical. (WSA 02 Part 1, section 2.8.7) The action to provide for above ground sewers constitutes a **WITNESS POINT**. The Principal shall advise at the time of notification by the Designer whether the option to confer is required.

WP

5. The Designer shall show on the Drawings the extent of external protection required to be undertaken by the Contractor. External protection shall be shown to comply with the DEVELOPMENT CONSTRUCTION SPECIFICATION - SEWERAGE SYSTEM.

External Protection

6. Where sewer pipes or rising mains are to be located in close proximity to other services pipes or where there is the likelihood of the pipes not being recognised as sewerage pipes, the Designer shall provide for the pipes to be colour coded and shown on the Drawings accordingly.

Colour Coding

7. Piers for any above ground sewer pipeline shall be in accordance with the SEWERAGE CODE OF AUSTRALIA Drawing SEW-106.

Piers

8. The pipeline alignment shall be such that no property connection sewer is to be more than 10m in length.

Property Connection

9. The Designer shall ensure that connections to the pipeline shall be not more than 1500mm in depth below the finished surface.

Connection Depth

10. The Designer shall allow for adequate working area, waste removal and transport arrangements where scouring points or inspection pipe locations are nominated.

Special Allowances

11. The Designer shall design thrust blocks to resist maximum pressure of the pipe, not the estimated surge pressure.

Thrust Blocks

12. The Designer shall provide for surge control by specifying an appropriate rising main material and class selection.

Surge Control Method**D12.11 JOINTS**

1. Gravity sewers and rising mains shall generally be spigot and socket joints with rubber rings (elastomeric) complying with AS 1646, or butt welded in the case of polyethylene pipe.

Rubber Ring or Butt Welded

2. Flanged joints connecting pipes, fittings, valves and pumps shall comply with AS 2129 (Flanges shall be Table C) or AS 4087, Class 16, as appropriate.

Flanges

3. The concurrence of the Sewer Authority shall be obtained for the type of joint to be used (WSA 02 Part 4, section 4.8).

D12.12 MINE SUBSIDENCE AREAS AND AREAS OF SLIPPAGE

1. The Designer shall accommodate the movement associated with the ground strain for the area, as advised by the Mine Subsidence Board for sewerage jointing systems in proclaimed Mine Subsidence Areas, or in a known or expected area of subsidence or slippage. The design ground strain for the development shall be detailed on the Drawings.

Ground Strain

2. The pipe jointing system selected shall be capable of accepting ground movements, without impairing the water tightness of the joint, for the ground strain as advised by the Mine Subsidence Board. For areas with high ground strains a pipe jointing system using shorter effective length pipes and/or deep socket fittings shall be used. This action constitutes a **WITNESS POINT**. The Principal shall advise at the time of notification by the Designer whether the option to confer is required.

Pipe Jointing System

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3. Where the Mines Subsidence Board does not cover an area of known, or suspected, subsidence or slippage, the above requirements shall still apply. **Areas Applicable**

MATERIALS

D12.13 UNPLASTICISED PVC (uPVC) GRAVITY PIPE

1. Unplasticized PVC (uPVC) pipe shall be specified to be manufactured in accordance with AS/NZS 1260, designed in accordance with AS/NZS 2566.1 and with rubber ring (elastomeric) spigot and socket joints. (WSA 02 Part 2, section 3). The pipe shall be not less than Class 6. **Standard**
2. The Designer shall ensure that PVC pipe is compatible with ductile iron (DI) pipe where necessary. **DI Compatible**
3. Fittings for use with PVC pipe shall be elastomeric seal jointed. **Fittings**

D12.14 UNPLASTICISED AND MODIFIED PVC (uPVC and PVC-M) PRESSURE PIPE

1. Unplasticized PVC (uPVC) pressure pipe shall be specified to be manufactured in accordance with AS/NZS 1477 and AS/NZS 4765, designed in accordance with AS/NZS 2566.1, and with rubber ring (elastomeric) spigot and socket joints. Modified PVC (PVC-M) pipes and fittings shall be specified to be manufactured in accordance with AS/NZS 4765, designed in accordance with AS/NZS 2566.1, and with rubber ring (elastomeric) spigot and socket joints. (WSA 02 Part 2, section 3). The pipe class shall be selected based on pumping design and site conditions. **Standard**
2. The Designer shall ensure that PVC pressure pipe is compatible with ductile iron pipe where necessary. **DI Compatible**
3. Fittings for use with PVC pressure pipe shall be elastomeric seal jointed. **Fittings**

D12.15 DUCTILE IRON (DI) PIPE AND FITTINGS

1. Ductile iron pipes and fittings shall be specified to be manufactured and cement mortar lined in accordance with AS/NZS 2280 minimum Class K9 for rubber ring (elastomeric) joints. Where pipes are flanged, Class K12 shall be specified. (WSA 02 Part 2, section 6) **Standard**
2. The Designer shall specify cement mortar lining in accordance with AS 1281, or fusion-bonded medium density polyethylene to AS/NZS 4321. External protection shall be epoxy coating to AS 3862 where not otherwise specified as sleeved or wrapped, taking into account the type of corrosion protection required. **Corrosion Protection**
3. Generally, pipe and fitting joints shall be specified to be spigot and socket type using a rubber ring (elastomeric) push in seal made of natural rubber, or ethylene propylene rubber with compounds complying with AS 1646. The seal shall be a single jointing component shaped to provide both groove lock and seal mechanisms. **Joints**
4. Flanges shall be specified to be manufactured in accordance with AS 2129 Table C. Bolts and nuts for flanged joints shall be in accordance with AS 2129 and galvanised in accordance with AS 1214 or stainless steel in accordance with AS 2837 as for pumps specified in the specification DEVELOPMENT CONSTRUCTION SPECIFICATION – SEWERAGE SYSTEM. **Flanges**

D12.16 VITRIFIED CLAY (VC) PIPES AND FITTINGS

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|---|-----------------|
| 1. Vitrified Clay pipes and fittings shall be specified to be manufactured in accordance with AS 1741 and designed in accordance with AS 4060. (WSA 02 Part 2, section 2) | Standard |
| 2. Pipe and fitting shall be spigot and socket type using roll on rubber ring (elastomeric) joints. Natural rubber shall not be used. | Joints |

D12.17 STEEL PIPE AND FITTINGS

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| 1. Steel pipes and fittings shall be specified to be manufactured in accordance with AS 1579 and AS/NZS 1594 and designed to AS/NZS 2566.1. (WSA 02 Part 2, section 8). | Standard |
| 2. The Designer shall specify the jointing system where long-term corrosion resistance, ease of construction or special circumstances dictate the need. The pipe jointing shall be either: | Joints |
| (a) Rubber ring (elastomeric) jointed to conform to AS 1646, or | |
| (b) Welded with butt welding or by using a welding collar with the application of a polyethylene heat shrunk sleeve over the weld, or wrapped, or | |
| (c) Flanged to comply with AS 4087 table C. Bolts and nuts for flanged joints shall be in accordance with AS 2129 and galvanised in accordance with AS 1214, or stainless steel in accordance with AS 1444 as for pumps specified in the DEVELOPMENT CONSTRUCTION SPECIFICATION - SEWERAGE SYSTEM. | |

D12.18 POLYETHYLENE PIPE AND FITTINGS

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| 1. Polyethylene pressure pipe shall be specified to be manufactured in accordance with AS/NZS 4129 and AS/NZS 4130 and designed to AS/NZS 2566.1. (WSA 02 Part 2, section 4) | Standard |
| 2. Fittings shall comply with AS/NZS 4129 with compounds to AS/NZS 4131. | Fittings |

D12.19 GLASS REINFORCED PLASTIC (GRP) PIPE AND FITTINGS

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|---|-----------------|
| 1. Glass filament reinforced thermosetting plastics (GRP) pipes shall be specified to be manufactured to AS 3571 and designed to AS/NZS 2566.1. (WSA 02 Part 2, section 5). | Standard |
| 2. Fittings shall comply with AS 2634. | |

PUMP STATIONS**D12.20 GENERAL**

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| 1. The Designer shall take into account access, site maintenance and restoration, easement, power supply and working area when locating pump stations in road reserves or on private property. This action constitutes a WITNESS POINT . The Principal shall advise at the time of notification by the Designer whether the option to confer on the locations is required. | Location |
| | WP |

2.	Where not provided as a Vacuum Sewerage System, the Designer shall provide for all pump stations to be of the single wet well submersible pump style with self contained freestanding switchboards suitable for external use.	Type
3.	The Designer shall provide for the construction of the pump well after taking into consideration the ground and site conditions.	Conditions
4.	Preformed components or systems, complying with the Drawings, if any, may be used in lieu of in-situ construction provided: <ul style="list-style-type: none"> (a) Preformed concrete wall units are to be manufactured to AS4058. The Designer shall take into account the cover requirements for reinforcing steel and cement types. (b) Joints shall be internal flush (c) The Designer shall ensure selected components make a watertight system and have a satisfactory surface finish. 	Preformed Components
5.	Where the pump station site is exposed to possible flooding, the Designer shall provide for the top of pump well to be one (1) metre above the 1 in 100 year flood level or to such other level as provided by Council's planning instruments, whichever is the higher.	Protection Against Flooding
6.	The Designer shall provide for the design of pump wells against flotation both during the construction/installation stage and whilst operating under flood conditions designed as above.	Protection Against Flotation
7.	Package pump station units may be designed, with the prior concurrence of the Sewer Authority, where the area being serviced is small and/or their inclusion contributes to an overall lesser depth of excavation in the system.	Package Units
8.	The Designer shall provide for internal surfaces of wet wells to be prepared and coated with an epoxy paint system approved by the Superintendent. All bolted connections within wet wells shall be stainless steel complying with AS 1449 grade 316.	Surfaces
9.	The Designer shall size pipes and pump station capacity to avoid surcharges under design flow conditions. The Designer shall provide for overflows in strict accordance with the conditions of the licence, if any, permitting sewage overflow.	Overflows
10.	The Designer shall provide for alarms and signals systems with the concurrence of the Sewer Authority.	Alarms and Signals
D12.21 PUMP		
1.	The Designer shall specify special requirements, if any, for materials to be used in the pump station, taking into consideration the nature and composition of the sewage to be pumped. Each pump shall be fitted with a flushing valve installed in accordance with the manufacturer's recommendations.	Special Requirements
2.	The Designer shall provide for pump stations to be fitted with suitably sized pumps, consistent with other pumps in service, in conventional duty pump/standby pump arrangement.	Size
3.	Each pump shall be capable of passing solids of not less than 75mm diameter unless grinding equipment is incorporated	Impeller Clearance
4.	Each pump shall be capable of being removed with the aid of fixed guide rails.	Removal
5.	Pump sets are to be interchangeable within each pump station.	Inter-

changeable

6. The Designer shall design structural steelwork in accordance with HB 48.

Structural Steelwork**D12.22 ELECTRICAL**

1. Notwithstanding other clauses mentioned herein, the Designer shall be responsible for the design of the equipment as suitable for the purpose. Equipment design shall comply with the requirements of the relevant standard specification.

Design Responsibility

2. The Designer shall provide for Switchgear Control Assembly (SCA), SCA housing and electrical requirements as detailed in the DEVELOPMENT CONSTRUCTION SPECIFICATION-SEWERAGE SYSTEM.

SCA and Electrical

3. Where more than one (1) item of equipment is designed to form a particular function, all such items of equipment shall be identical and completely interchangeable (eg pilot lights, pushbuttons, relays, etc).

Inter-changeability

4. The switchboard shall be installed visibly and physically accessible above areas at risk of flooding.

Switchboard

5. Ambient conditions shall be within the normally accepted limits of 0°C to 45°C.

Ambient Conditions

6. The switchboard shall be connected to the local electricity supply system.

Connection to Local Supply

Nominal system parameters:

- (a) 415 volt, 3-phase, 4-wire, 50 Hz, solidly earthed neutral system.
(b) Prospective Fault Current: As specified by the Local Supply Authority.

7. The works shall be designed in accordance with and subject to the provisions of MEW E101, except where modified by this Specification.

Standards

8. The pump station shall be designed for fully automatic operation in the unmanned condition.

Automatic Operation**D12.23 WATER SUPPLY**

1. The Designer shall provide for automatic well washers and flush valves to be installed at each pump station and controlled so that they operate when the duty pump is operating.

Cleaning

2. The Designer shall provide at all pump stations for an adequate water supply for cleaning purposes. This supply shall be protected from contamination due to backflow by the installation of a registered break tank or reduced pressure zone device in accordance with AS 3500.

Contamination Protection**D12.24 LADDERS**

1. Ladders shall comply with AS 1657 and applicable Occupational Health and Safety legislation. (WSA 02 Part, section 2.9.3.4)

Standard

2. If required, the Designer shall set intermediate landings in wells to achieve the minimum head room clearance. Wherever possible, the landing shall be located adjacent to fittings and machinery requiring maintenance.

Ladder Landings

3. Ladder cages shall not be used on ladders in pump station wet wells.

Ladder Cages

D12.25 TELEMETRY

1. The Designer shall provide for telemetry requirements in accordance with the schedule supplied by the Sewer Authority.

Schedule

2. The telemetry system is to be compatible with the existing system, if any, in use.

Compatibility

D12.26 OTHER APPURTENANCES

1. The Designer shall provide for venting of each pump station, and in built up areas, after consultation with the local Council.

Venting

2. The Designer shall provide for machinery lifting equipment including pump chains.

Lifting Equipment

3. The Designer shall provide pressure tapping and gauges for all valves, including isolation and non-return valves and as detailed in the DEVELOPMENT CONSTRUCTION SPECIFICATION-SEWERAGE SYSTEM.

Gauges

4. The Designer shall take account of the possibility of site flooding ingress and overflow, and Occupational Health and Safety requirements in providing for access and inspection covers.

Covers

DOCUMENTATION

D12.27 SEWERAGE SYSTEM

1. The Principal shall submit, to the Sewer Authority for approval, four (4) copies of the proposed sewerage system design, including calculations prior to commencement of construction. (WSA 02 Part 1, section 5). This action constitutes a **WITNESS POINT**. The Principal shall advise at the time of notification by the Designer whether the option to direct the submission to the Sewer Authority is taken..

Review

HP

2. The Drawings shall show to scale:

- (a) Plan showing:

Plan

- (1) Lot boundaries and lot numbers
- (2) Location and chainage of all maintenance holes, junctions and dead ends
- (3) Maintenance hole types
- (4) Location and size of all gravity and rising mains and pump stations
- (5) Location of vents
- (6) Sewer main number and maintenance hole number
- (7) Existing sewer mains, junctions and maintenance holes
- (8) For level lots, spot levels at the lot extremities to show that at least 90 per cent of the area of the lot can be connected to the sewer by gravity.
- (9) Hatching shall show the area of any lot not serviced.
- (10) Site contours

- (11) Existing and proposed features and services
- (12) North point and scale bar
- (13) Easement location
- (14) Arrangement of other utilities.

(b) Longitudinal section showing:

**Longitudinal
Section**

- (1) Reduced levels for natural surface and design surfaces at all changes in grade
- (2) Maintenance hole locations and type
- (3) Maintenance holes numbered in accordance with the Sewer Authority's Asset Register
- (4) Invert levels for maintenance holes inlet and outlet
- (5) Size, type, class and grade of pipe
- (6) Location, invert level and size of all drainage lines, water mains, and other utility services crossing the main
- (7) Notation regarding all joining lines
- (8) Property ownership
- (9) Note upstream ET's at each maintenance hole

- (10) (j) Note "In road" trench conditions

(c) General arrangement of pump stations with site plan; concrete outlines; number, make, model and details of pumps; inlet and outlet pipework details and levels; pump cut in; cut out and alarm levels; switchboard location; pump station access details; design starts per hour.

Pump Stations

(d) Details of corrosion protection required for pipes and fittings.

**Pipe
Protection**

(e) Areas designated for trenchless pipe installation.

**Trenchless
Installation**

3. Detail plans shall be drawn to a scale of 1:500 and longitudinal sections to a horizontal scale of 1:1000 and a vertical scale of 1:100.

Drawing Scale

4. Drawings shall be "A3" size and/or 'A1' after consultation with the Sewer Authority.

Drawing Size

5. Drawings shall be provided also in electronic form after consultation with the Sewer Authority.

**Electronic
Form**

D12.28 PUMP STATION

1. The Principal shall submit, to the Sewer Authority for approval, prior to commencement of the manufacture of any pumps and control equipment, four (4) copies of the following:

Review

- (a) Switch and Control Gear Assemblies - Proposed fully dimensioned manufacturing details, general arrangement (showing internal/external details) and foundation/gland plate details.
- (b) Common Control - Complete circuit diagram and description of operation.

- (c) Schedule of Equipment - Completed as to the equipment to be provided.
- (d) Other Engineering drawings as required to fully describe the proposed equipment.

The submission of the documents constitutes a **WITNESS POINT**. The Principal Shall advise at the time of notification by the Designer whether the option to direct the submission to the Sewer Authority is taken.

WP

2. The Designer shall take into consideration the technical requirements to minimise all risks associated with entry into confined space.

Risk

3. Drawings shall be on "A3" size. All symbols used shall conform to AS 1102 and all wires and terminals shall be numbered.

Drawing Size

4. Drawings shall also be provided in electronic form after consultation with the Sewer Authority.

Electronic Form

D12.29 ASSET REGISTER

1. The Designer shall provide asset schedules and Drawings in a form consistent with the existing or proposed Asset Register after consultation with the Sewer Authority. (WSA 02 Part 1, section 5.3.2).

Consistency

SPECIAL REQUIREMENTS

D12.30 RESERVED

D12.31 RESERVED

D12.32 RESERVED

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SPECIFICATION D12 - SEWERAGE SYSTEM

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