



Assets Planning and Delivery Group
Engineering

Strategic Product Specification

SPS 702 Pre-cast Concrete Wastewater Pumping Stations

VERSION 2
REVISION 0

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FOREWORD

Each Strategic Product Specification has been prepared to inform Water Corporation staff, consultants, contractors and land developers of the requirements for selecting and acquiring a manufactured product to be used in strategic Corporation infrastructure. The definition of 'Product' includes items that comprise assembled components, equipment or plant for mechanical, electrical and civil infrastructure applications.

The objective of a Strategic Product Specification is to specify fit-for-purpose Product which will contribute to the provision of effective water services at least whole-of-life cost and with least risk to service standards and safety. A Strategic Product Specification also provides uniform standards for compatibility of new water infrastructure with existing water assets.

Many Strategic Product Specifications have drawn on the design, asset management and operational experience of Product performance in live service gained by the Corporation over time. Some Strategic Product Specifications have drawn on the experience of the water industry nationally by referencing Australian or WSAA standards.

Strategic Product Specifications are intended for reference and use in the following typical procurement scenarios:

- Capital funded infrastructure design and construction work;
- Private developer funded subdivision infrastructure for takeover by the Corporation;
- Operationally funded infrastructure design and construction work;
- Corporation period contracts for Product purchases;
- Product purchases for stock or for miscellaneous minor work.

A published Strategic Product Specification will, in some cases, comprise technical content that is typical of a range of products of the same type (type specification) but may exclude specific requirements that should apply to a particular project or application. In such cases, the project designer is required to document the supplementary project specific requirements in the 'Project Specific Requirements' Appendix of the Specification.

The text of a published Specification should not be directly modified. In the event that a text variation is considered necessary to accommodate the needs of a particular project or application, the text modification should be documented in the appropriate Clause of a 'Project Specific Requirements' Appendix.

Enquiries relating to the technical content of this Specification should be directed to the Senior Principal Engineer, Wastewater Conveyance, Engineering.

Head of Engineering

This document is prepared without the assumption of a duty of care by the Water Corporation. The document is not intended to be nor should it be relied on as a substitute for professional engineering design expertise or any other professional advice.

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Strategic Product Specification

SPS 702

Pre-cast Concrete Wastewater Pumping Stations

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1 Scope and General

1.1 Scope

This Specification sets out requirements for the design, manufacture, production testing, handling and delivery of pre-cast concrete wastewater pumping station and associated chamber and pit components intended for installation in developed land across Western Australia. The specification is in general alignment with AS 3735 with respect to the durability of below ground pre-cast concrete pumping and associated products for wastewater conveyance applications. The specification details the means by which compliance with specified requirements shall be demonstrated together with the criteria for Product acceptance.

1.2 Referenced Documents

The following documents are referenced in this Specification:

Water Corporation

DS 50	Design and construction requirements for gravity sewers DN 150 to DN 600
DS 51	The Design and Construction of Wastewater Pumping Stations and Pressure Mains 4.5 to 180 Litres Per Second Capacity
DS 95	Standard for the selection, preparation, application, inspection and testing of protective coatings on Water Corporation assets
S151	Prevention of Falls Strategic Products Register
SPS 801	Access Covers for General Purposes
SPS 802	Assisted-Lift Access Covers

AS

1199	Sampling procedures for inspection by attributes - Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
1379	Specification and supply of concrete
1478.1	Chemical admixtures for concrete, mortar and grout - Part 1: Admixture for concrete
1646	Elastomeric seals for waterworks purposes (Performance requirements in AS 681)
681.1	Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications - Vulcanized rubber
681.2	Elastomeric seals - Material requirements for pipe joint seals used in water and drainage applications - Thermoplastic elastomers
1726	Geotechnical site investigations
2550.1	Cranes, hoists and winches – Safe use – General requirements
2550.3	Cranes, hoists and winches – Safe use – Bridge, gantry, portal (including container cranes), jib and monorail cranes
2550.5	Cranes, hoists and winches – Safe use – Mobile
2550.11	Cranes, hoists and winches – Safe use – Vehicle loading
2758.1	Aggregates and rock for engineering purposes - Part 1: Concrete aggregates
3582	Supplementary cementitious materials for use with portland and blended cement
3600	Concrete Structures
3735	Concrete Structures Retaining Liquids
3972	Portland and blended cements
3996	Metal access covers, road grates and frames
4198	Precast concrete access chambers for sewerage applications
4671	Steel reinforcing bars for concrete
5100.2	Bridge Design – Design Loads

ASTM

C443M	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric)
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C877M	Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections (Metric)
C990M	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants (Metric)
C1628	Standard Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets
EN	
124	Gully tops and manhole tops for vehicular and pedestrian areas – Design requirements, type testing, marking, quality control
AS/NZS	
1170.0	Structural design actions - Part 0: General principles
1170.0 Supp. 1	Structural design actions - Part 0: General principles - Commentary
1170.1	Structural design actions - Part 1: Permanent, imposed and other actions
3725	Design for installation of buried concrete pipes
4058	Precast concrete pipes (pressure and non-pressure)
4671	Steel reinforcing materials
4680	Hot-dipped galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS ISO IEC	
9001	AS/NZS ISO 9001: Quality management systems – Requirements
17000	ISO/IEC 17000: Conformity assessment – Vocabulary and general principles
17025	ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories
17026	ISO/IEC 17026 (TR): Conformity assessment – Example of a certification scheme for tangible products
17067	AS/NZS ISO/IEC 17067: Conformity assessment – Fundamentals of product certification and guidelines for product certification schemes

1.3 Definitions and Notation

The following definitions are intended to clarify the terminology used in this Specification.

1.3.1 Australian Standards®

Standards that are developed, published and maintained by Standards Australia

1.3.2 Certificate

A formal certificate issued by a Conformity Assessment Body as an outcome of a compliance audit in accordance with a Certification System.

1.3.3 Certification Mark

A proprietary mark of product conformity issued in accordance with ISO/IEC 17030.

1.3.4 Certification System

An impartial third party product certification scheme or combination of schemes, as exemplified in ISO/IEC TR 17026, that are in accordance with the fundamentals of AS/NZS ISO/IEC 17067 and with the guiding principles of ISO/IEC Guide 28.

NOTE: The effect of this is to require maintenance by the manufacturer of effective production control planning in addition to full type testing from independently sampled production and subsequent verification of conformity with specified standards.

1.3.5 Compliant Product

Product that has been assessed by means of Product Appraisal as conforming to standards and specifications that are specified by the Corporation.

1.3.6 Conformity Assessment Body (CAB)

A third party organisation that has been duly accredited as meeting the requirements of AS/ANZ ISO/IEC 17065 by a signatory member of the International Accreditation Forum (IAF) Multilateral Arrangement (MLA), previously known as a Certification Body.

1.3.7 Corporation

The Water Corporation of Western Australia.

1.3.8 Manufacturer

An entity or combination of entities that are responsible for selection, processing and control of Product constituent materials or compounds and for the processing equipment that collectively result in the manufactured product.

1.3.9 Notation

Statements governed by use of the word 'shall' are mandatory or 'normative' requirements of the Specification. Statements expressed by use of the words 'should' or 'may' are 'informative' but not mandatory and are provided for information and guidance. Notes in Specification text are informative. Notes that form part of Specification Tables are normative. An Appendix to the Specification that is designated 'normative' contains mandatory requirements. An Appendix that is designated 'informative' is provided for information and guidance only. The term 'specified' includes requirements of the Specification and requirements stated or referenced in other project documentation.

1.3.10 Officer

A duly authorised representative or appointed agent of the Corporation.

1.3.11 Product

A single unit or multiple units of manufactured end product or an assembly of manufactured component products, materials or equipment. This Specification and accompanying Purchasing Schedule define the nature and details of Product to be supplied.

NOTE 1: An end product is most commonly an output of manufacturing processes that result in finished end products having the same features and characteristics and can be the result of a single or multiple production batches.

NOTE 2: Manufactured equipment and assemblies of Product components or materials are commonly procured for mechanical, electrical and civil infrastructure applications.

1.3.12 Product Appraisal

A formal process whereby Product is subjected to systematic engineering assessment to determine its fitness for prescribed end uses and to evaluate its conformity with specified standards and requirements. Product Appraisal includes verification of the extent of compliance in accordance with the requirements of a relevant 'Technical Compliance Schedule'.

1.3.13 Product Assessor

An organization, Officer or other person who, having demonstrated specialist product knowledge and competence acceptable to the Corporation, is appointed to evaluate Product, appraises the Product and issues one or more Product Verification Reports.

1.3.14 Product Certification

A formal process whereby the production and management systems for the manufacture of Product, are assessed by a Conformity Assessment Body to evaluate compliance of these systems with specified product standards and tests, in accordance with Certification Scheme rules.

1.3.15 Product Verification Report

A formal report wherein a Product Assessor evaluates the extent of Product compliance with the specified product standards and specifications.

NOTE: Verification may be on a project-by-project basis or at agreed intervals, as appropriate to the scope of a Purchasing Schedule and Product end use, subject to determination by the Corporation.

1.3.16 Product Warranty

A formal express undertaking by a Supplier that indemnifies the Corporation against the consequences of supplied Product failure to comply with specified fitness for application and in-service life expectancy performance requirements.

1.3.17 Purchasing Schedule

A Corporation purchase order, tender, schedule of prices, bill of quantities, or specification that details the nature, quantity and other characteristics of Product to be supplied, purchased or installed.

1.3.18 Quality System

A management system that establishes, documents, implements and maintains organizational structures, resources, responsibilities, processes and procedures for the manufacture of Product and provision of Product related services in accordance with the requirements of AS/NZS ISO 9001.

1.3.19 Standards Australia

The peak non-government standards development body in Australia which develops and publishes Australian Standards®.

1.3.20 Strategic Product

An essential infrastructure component whose performance is critical to the elimination of risk to the safe and effective provision of water services, which are functions of the Corporation under the Water Corporation Act as licensed under the Water Services Coordination Act.

NOTE: Strategic product is a component of permanent Corporation infrastructure. Ancillary operational and safety equipment that does not form part of permanent infrastructure but offers exceptional enhancements in operational performance or personnel safety may also be deemed strategic.

1.3.21 Strategic Product Appraisal Process

The process described in Section 3 of the Strategic Products Register whereby manufactured products and equipment are evaluated and authorised for use in Corporation infrastructure, subject to demonstrated conformity with the nominated product performance requirements.

1.3.22 Supplier

An entity or combination of entities that is responsible for the supply of Product.

NOTE: A Supplier may be a Manufacturer, owner, producer, distributor, vendor, agent, tenderer or contractor for supply of Product or Product related service.

1.3.23 Testing

The determination of Product characteristics by inspection and by the application of specified test procedures in order to determine Product conformity with nominated performance requirements.

2 Pumping Station Configuration

For the purposes of this Specification, pre-cast concrete pumping stations together with associated chambers and valve pits shall, typically, be designed and arranged to provide nominal internal dimensions and configurations as follows:

- **Type 6** (Pumped flow rates ≤ 6 l/s) pumping station - 1200 mm wet well shaft and a separate detached pre-cast concrete 1050 mm circular person entry valve pit for pumped discharge pipework and valves;
- **Type 10** (Pumped flow rates ≤ 10 l/s) pumping station - 1800 mm wet well shaft without a person entry valve pit for pumped discharge pipework and valves;
NOTE: The standard arrangement for a Type 10 pumping station provides for direct burial of pumping discharge valves and associated pipework, with no requirement for a person entry valve pit.
- **Type 40** (Pumped flow rates > 10 l/s and ≤ 40 l/s) pumping station - 2250 mm wet well shaft and, for pumping discharge pipework size DN 150 or larger, a separate detached pre-cast concrete 2250 mm circular person entry valve pit for pumped discharge valves and associated pipework;
NOTE: The standard arrangement for a Type 40 pumping station provides for direct burial of pumping discharge valves and associated pipework DN 100 or smaller, with no requirement for a person entry valve pit.
- **Type 90** (Pumped flow rates > 40 l/s and ≤ 90 l/s) pumping station - 3000 mm wet well shaft and a separate detached pre-cast concrete 2250 mm or larger circular person entry valve pit for pumped discharge pipework and valves size DN 250 or smaller;
NOTE: Arrangements for a Type 90 pumping station with discharge valves and associated pipework sized DN 300 or larger will require consideration of a pre-cast concrete circular valve pit larger than 2250 mm in diameter.
- **Type 180** (Pumped flow rates > 90 l/s and ≤ 180 l/s) pumping station - 5000 mm bi-chamber (divided) wet well shaft, a separate detached circular inlet (flow-splitting) chamber 3000 mm in diameter (or larger) and a separate detached rectangular **in-situ RC** (4700 mm X 2700 mm or larger) person entry valve pit for pumped discharge pipe/valve work;
NOTE: Typically, a Type 180 pumping station arrangement provides for a cast-in-situ RC wet well with an integrally cast rectangular 2100 mm X 1300 mm inlet (flow splitting) chamber. An option to pre-cast a Type 180 pumping station off site would, necessarily, require consideration of separate (detached) circular pre-cast assemblies comprising wet well, flow splitting chamber and, possibly but unlikely, valve pit. The land take requirement for and economics of an adequately sized pre-cast valve pit are unlikely to realize best value in comparison with an in-situ RC pit, given the small numbers of pumping stations of this size needed in the foreseeable future.
- **Type 350** (Pumped flow rates > 180 l/s and ≤ 350 l/s) pumping station - 7500 mm bi-chamber (or divided) wet well shaft, a separate circular flow-splitting inlet/mobile pumping chamber 3000 mm in diameter (or larger) and a separate detached rectangular **in-situ RC** (4700 mm X 2700 mm or larger) person entry valve pit for pumped discharge pipe/valve work;
NOTE: Typically, a Type 350 pumping station arrangement provides for a cast-in-situ RC wet well with an integrally cast rectangular 3900 mm X 2400 mm inlet (flow splitting) and mobile pumping chamber. An option to pre-cast a Type 350 pumping station off site would, necessarily, require consideration of separate (detached) circular pre-cast assemblies comprising wet well, flow splitting chamber and, possibly but unlikely, valve pit. The land take requirement for and economics of an adequately sized pre-cast valve pit are unlikely to realize best value in comparison with an in-situ RC pit, given the small numbers of pumping stations of this size needed in the foreseeable future.

Pumping station wet well type shall be selected in accordance with DS 51 and project requirements as specified in project needs documents and in associated standard and project-specific drawings. Typical arrangements and details for pumping station types 6, 10, 40 and 90 are shown on the drawings referenced in Section 7/Appendix A. Typical arrangements and details for pumping station types 180 and 350 may be adapted by reference to example drawings that will be nominated on a project by project basis, pending publication of standard and example drawings for those pumping station types.

NOTES:

1. Figures 2.1 to 2.6 show nominal **internal** dimensions that are typical of pumping wet wells, inlet chambers and valve pits in schematic outline only. Actual pumping station configurations and arrangement details should be in accordance with project drawings and project requirements generally.
2. Where current standard and example drawings detail wet well, inlet (flow splitting)/mobile pumping chamber and valve pit structures manufactured from cast-in-situ concrete, modified proposals for pre-cast concrete structural alternatives may be considered at project pre-planning or requirements setting stage. Pre-cast RC alternatives, in lieu of the larger (Type 180/350) in-situ RC valve pits, may not prove to be viable in terms of spatial footprint logistics and economics.

3. Performance requirements for pre-cast concrete wet well and associated inlet, flow-splitting, mobile pumping and valve pit chambers with nominal diameters ≤ 1800 mm may, by agreement on a project-by-project basis, be in accordance with SPS 700. Otherwise, pre-cast assembly design should be in accordance with this (SPS 702) specification.

Pre-cast concrete pumping station and associated chamber and valve pit assembly components shall be defined as illustrated in Figures 2.1 to 2.6 for typical pumping station components, supplemented by the definitions and descriptions below:

2.1 Access Cover

A removable system of single or multi-part (usually rectangular or square) access/lid components that cover the access opening of a pumping station wet-well, inlet chamber or associated valve pit for the purposes of person and equipment entry into and out of the well/chamber/pit below the opening.

2.2 Access Clear Opening (CO)

The dimensions of the unobstructed access opening (with all removable access cover parts removed), as defined in AS 3996.

2.3 Frame

A “manhole” top frame as defined in EN 124.1 that is the fixed part of an access opening cover and frame assembly/unit. It aligns with the “frame” definition in AS 3996 for cover/frame assemblies and facilitates the receipt, location and provision of support all round for the specified number of mating or interlocking single-part access cover/lid components.

2.4 Pumping Station Wet Well

A below ground chamber into which pipelines convey (usually raw) wastewater that originates within a designated catchment area, for intermittent short term storage and periodic pumping to a wastewater treatment facility or to another catchment system. The wet well is intended to provide safe access from above ground to persons and pumping equipment for the purposes of inspection, testing, obstruction removal, repair, maintenance and replacement work associated with the pumping facility.

2.5 Shaft Section/Liner

One of a number of standard depth wet-well/chamber/pit sections which together with other shaft sections/liners and a make-up shaft section/liner, where specified, form the wet-well/chamber/pit structure between precast base and finished surface. Shaft sections/liners are also known as ‘segments’ and are manufactured in a number of standard ‘full depth’ and shorter ‘make-up depth’ options to facilitate well/chamber/pit adjustment to match project installation depth and surface level.

NOTE: Where agreed, a shaft section/liner component may be formed by a reinforced concrete pipe of the same nominal diameter in accordance with AS/NZS 4058, provided that pipe and its mating joints with other pipe and section/liner components demonstrably conform with durability, concrete cover to reinforcement, water absorption, hydrostatic pressure and joint assembly test requirements as required by Section 6/Appendix A.

2.6 Precast Base

A pre-formed pre-cast wet-well/chamber/pit foundation component that comprises a structurally monolithic shaft and base section and which, sometimes, is pre-cored to facilitate inlet and outlet pipeline and other equipment connections.

2.7 Top Slab

A precast structural reinforced concrete (RC slab) into which an access cover and frame assembly is cast for the purposes of safely transferring self-weight and imposed loads to the structure below and to the surrounding backfill and soil material.

NOTE: Where agreed, a shaft section/liner component may be formed by a reinforced concrete pipe of the same nominal diameter in accordance with AS/NZS 4058, provided that pipe and mating pipe joints with other pipe/non-pipe

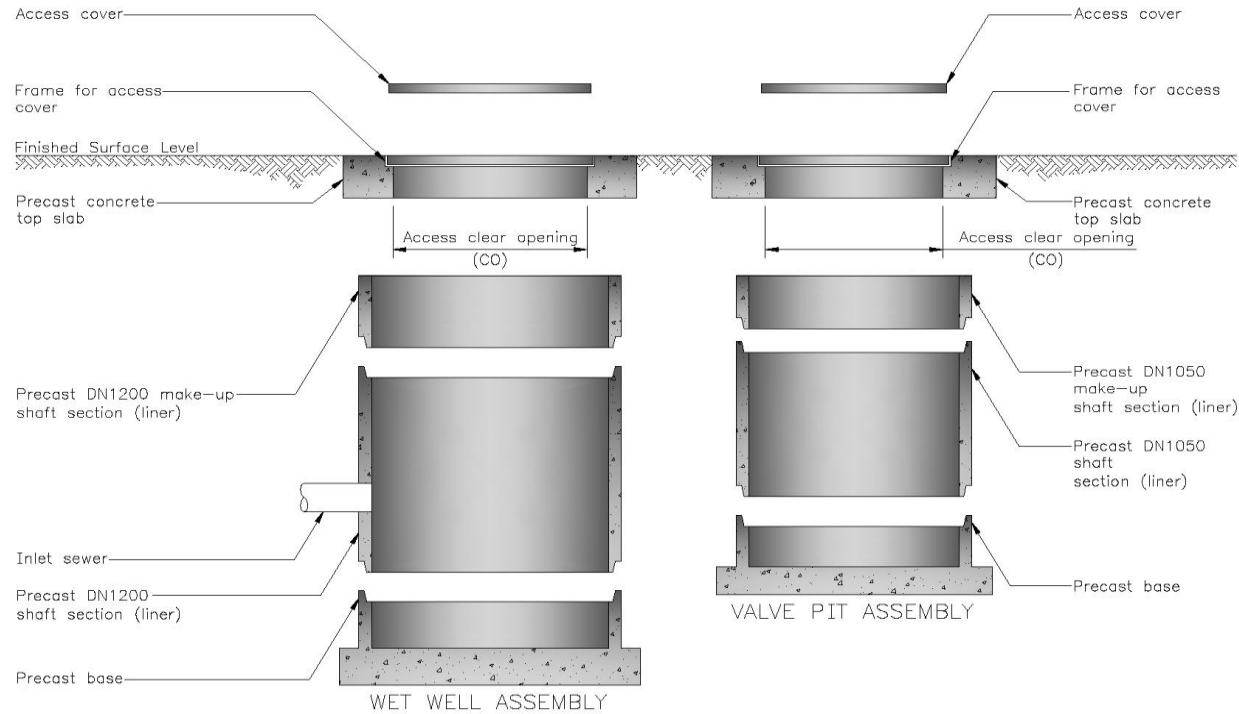


FIGURE 2.1:
 TYPE 6 PUMPING STATION
 (Flow rate ≤ 6 l/s)

REFER WATER CORP. STD DRAWING BB38-90-1 FOR ACCESS TO CAD FILES

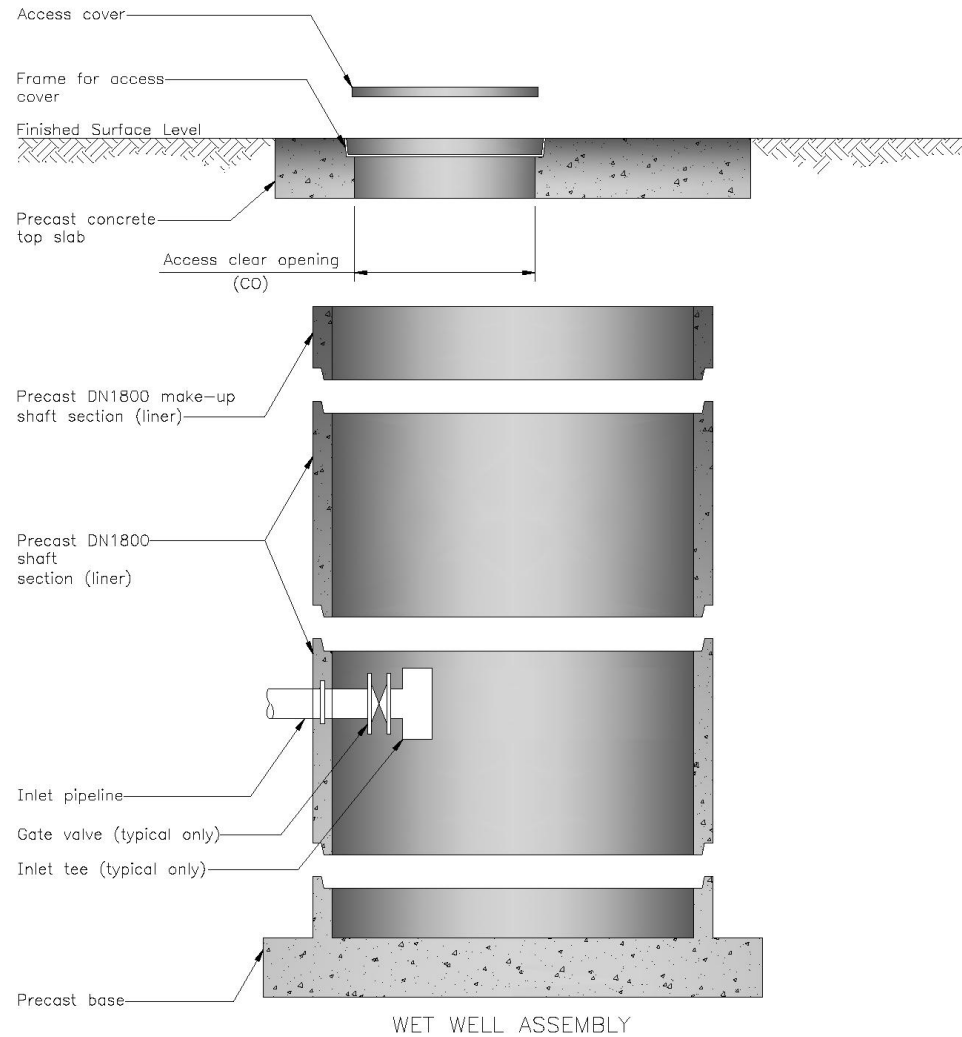


FIGURE 2.2:
 TYPE 10 PUMPING STATION
 (Flow rate ≤ 10 l/s)

REFER WATER CORP. STD DRAWING BB38-90-1 FOR ACCESS TO CAD FILES

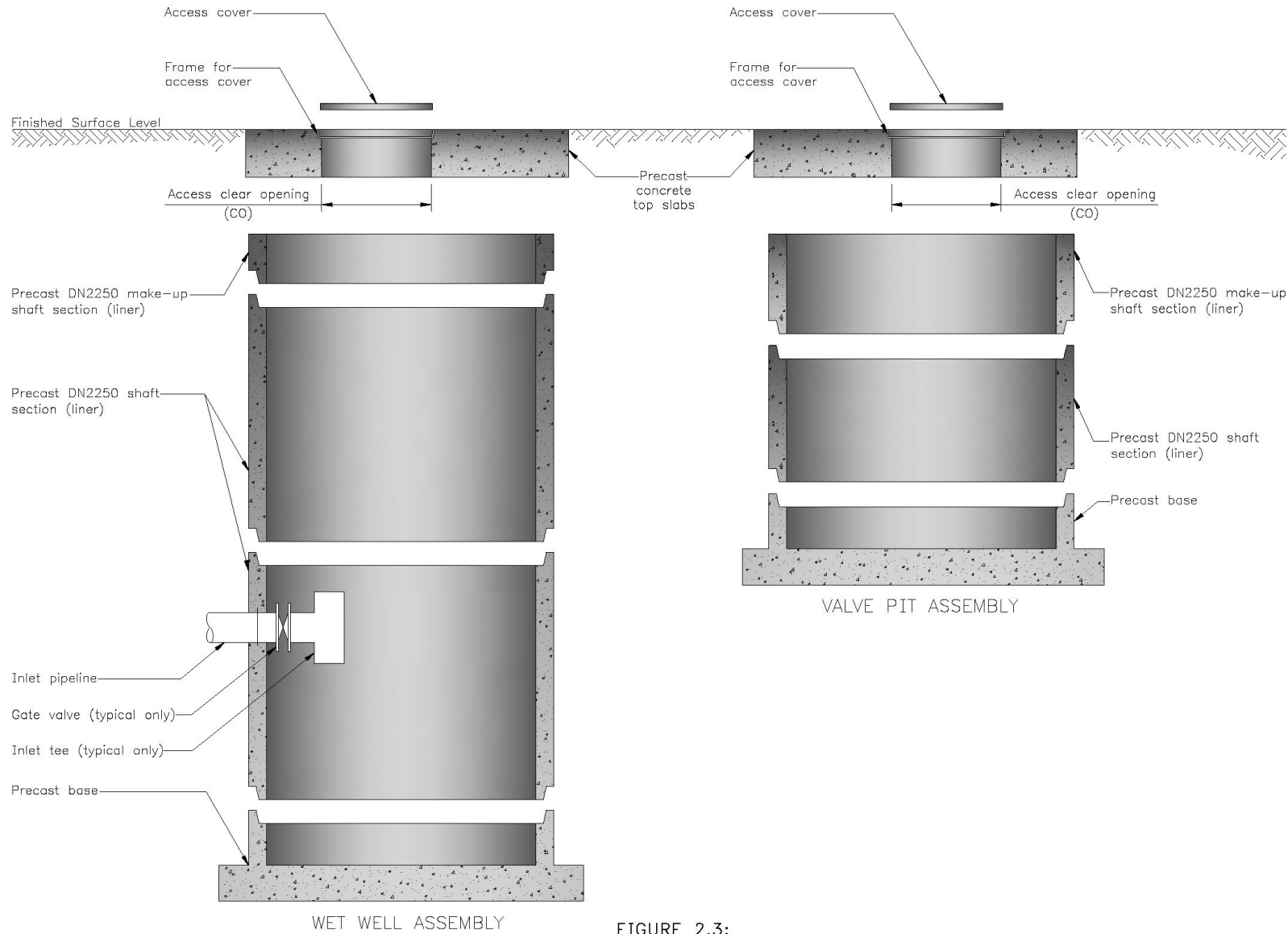


FIGURE 2.3:
TYPE 40 PUMPING STATION
 (Flow rate >10 l/s and ≤ 40 l/s)

REFER WATER CORP. STD DRAWING BB38-90-1
 FOR ACCESS TO CAD FILES

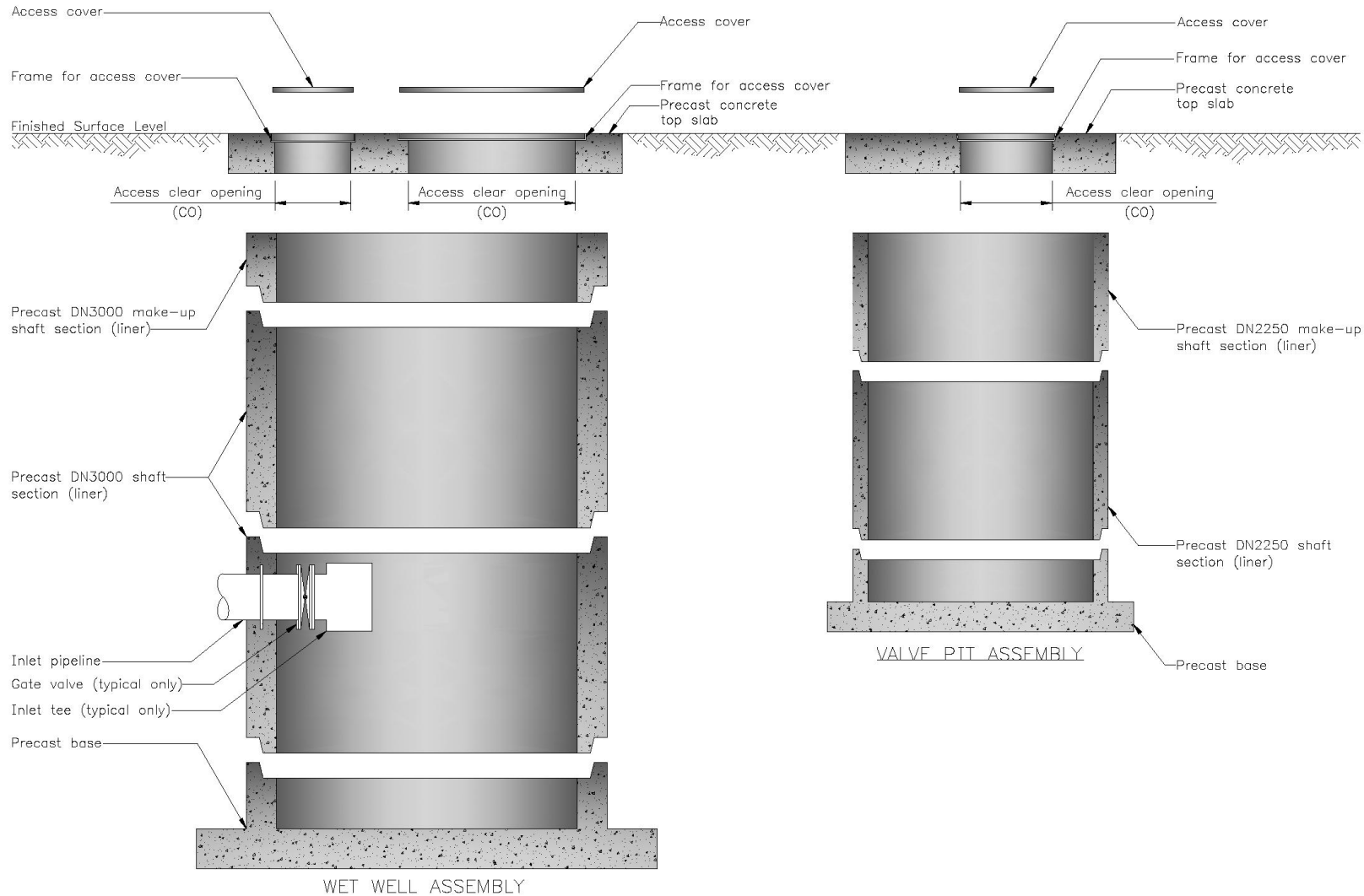


FIGURE 2.4:
 TYPE 90 PUMPING STATION
 (Flow rate >40 l/s and ≤ 90 l/s)

REFER WATER CORP. STD DRAWING BB38-90-1 FOR ACCESS TO CAD FILES

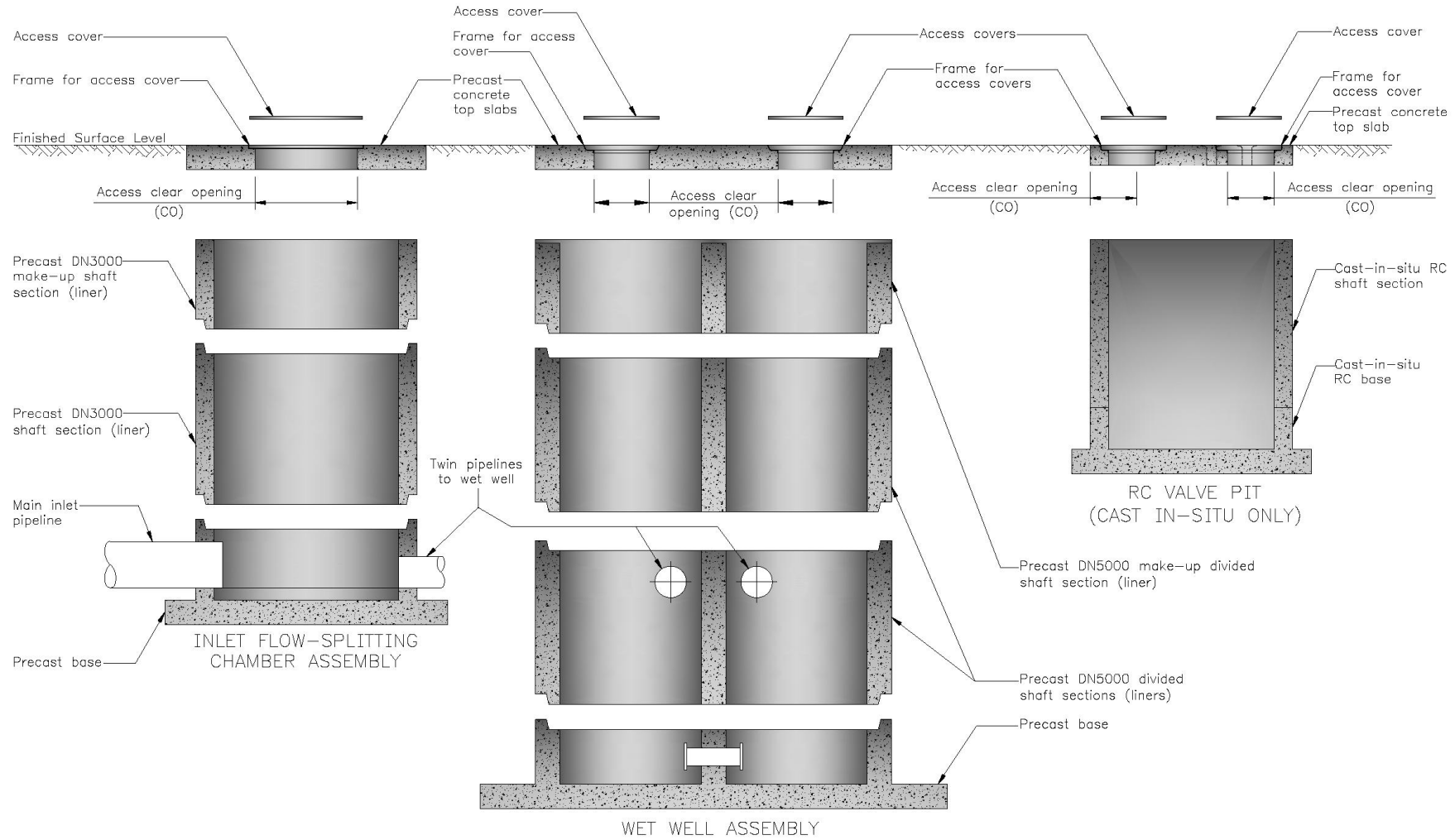


FIGURE 2.5:
 TYPE 180 PUMPING STATION
 (Flow rate >90 l/s and ≤ 180 l/s)

REFER WATER CORP. STD DRAWING BB38-90-1 FOR ACCESS TO CAD FILES

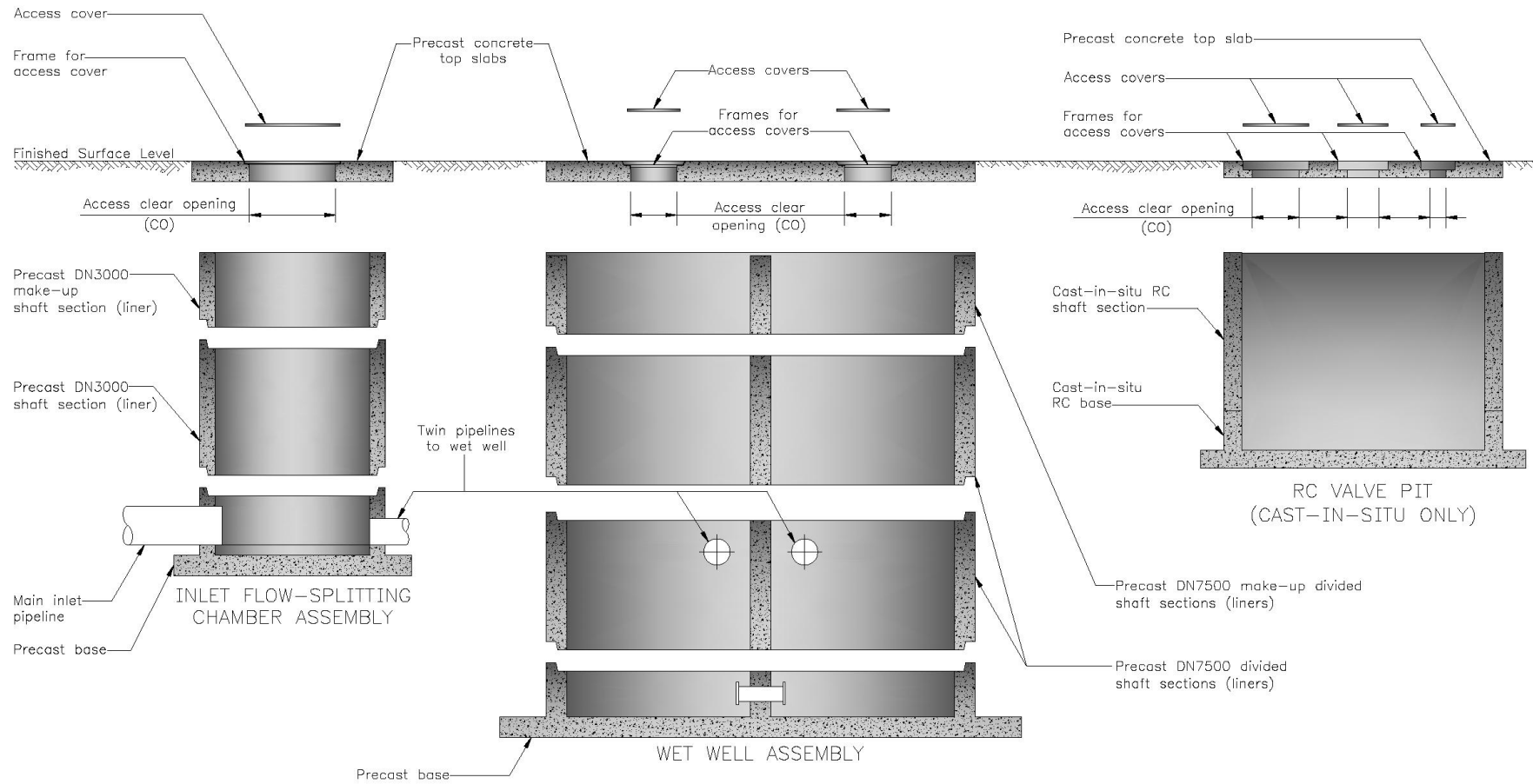


FIGURE 2.6:
 TYPE 350 PUMPING STATION
 (Flow rate >180 l/s and ≤ 350 l/s)

REFER WATER CORP. STD DRAWING BB38-90-1 FOR ACCESS TO CAD FILES

3 Performance Requirements

3.1 General

Pre-cast pumping station components shall be designed in accordance with the performance requirements herein including conformity with the nominated requirements of AS 4198, AS/NZS 4058, AS 3735 and AS/NZS 1170 as specified herein. Verification of conformity with requirements shall be in accordance with Section 6 of this Specification including an acceptable inspection and test plan as described therein.

There shall be no provision for fixed access step irons or ladders in pre-cast concrete pumping station components or component assemblies.

3.2 Dimensions

The diameter of pre-cast pumping station wet well shaft structures shall be selected in accordance with the relevant project drawings from one of the following:

Pumping Station Type	Nominal Internal Diameter (mm)
Type 6	1200
Type 10	1800
Type 40	2250
Type 90	3000
Type 180	5000
Type 350	7500

Pumping station shaft wall thicknesses and internal diameters shall, in the absence of alternative project specific requirements, be within the typical dimensional tolerances of AS 4198 for access chamber shaft wall components. Top slab dimensions and access cover arrangements shall be in accordance with those shown on the pumping station standard and example drawings for each pumping station type and cover configuration, as referenced in Section 7/Appendix A.

In accordance with DS 51 requirements, pumping station depth shall generally align with an incoming flow invert level no deeper than 6 metres.

NOTE: Application of the pumping wet well inflow storage/volume requirements of DS 51 should generally result in a depth from upper surface of top slab to upper surface of structural pumping station base slab that does not exceed 10 metres. Express engineering and business value justification is required to support proposals for deeper pumping station structures (e.g. to service deep legacy sewers, replace existing deep legacy pumping stations or other rational justified project need).

Pre-cast component dimensions and dimensional tolerances shall be supported by the Supplier's formal product drawings to be submitted and duly signed by the component design engineer, as a pre-requisite part of component authorisation for use in Corporation infrastructure.

3.3 Structural Design Basis

Pre-cast concrete pumping station structural components, from top slab - including an incorporated access cover and frame assembly - to structural base underside, shall be designed to safely bear access chamber assembly dead weight plus an imposed ultimate limit state vehicular traffic design load of 240 kN which corresponds to a W80 design wheel load as defined in AS 5100 (Bridge design standard), with particular reference to AS 5100.2 (Design loads).

3.4 Component Sealing and Jointing

The ends of circular pre-cast concrete components that are intended to be joined to mating components (e.g. shaft sections) shall be formed to close dimensional tolerances so that, when components of the same nominal diameter are assembled and jointed,:

- adjoining components are circular and are mutually concentric in terms of dimensional fit and structural continuity;

- joint dimensional clearances are adequate to install appropriate elastomeric, compressible or structural joint sealants with mechanical and deformation performance characteristics that will provide and maintain joint mechanical and seal performance in long-term service;
- joint load bearing continuity and tightness performance is assured over a nominated (agreed) range of component flexural (vertical, horizontal and rotational) movement relative to a mating or inter-locked component.

For wastewater wet well and inlet chamber (water-tight to 90kPa) applications, elastomeric joint seal components shall be nitrile-butadiene or styrene-butadiene rubber (NBR or SBR) in accordance with AS 1646 and joint performance shall be in accordance with ASTM C443M or ASTM C1628. An elastomeric seal of an appropriate IRHD hardness shall be nominated by the pumping station component joint manufacturer, based on pre-cast concrete system joint design characteristics.

For applications where joint water-tightness is not a specified requirement (e.g. dry soil-tight valve/equipment pit joints), joint sealing shall be effected by means of pre-formed flexible joint sealant in accordance with ASTM C990M including the application of a compatible joint surface primer for effective long term jointing system adhesion and seal.

The conformity of finished pre-cast concrete component joint dimensions, joint elastomers and sealants with requirements shall be capable of being verified in accordance with Section 6 of this Specification including an acceptable inspection and test plan as described therein.

The dimensional fit performance of mating (e.g. spigot to socket) component joints that, typically, form part of a pumping station wet well or associated chamber or pit **assembly** submission (e.g. pre-cast concrete shaft and base assembly) shall also be capable of being verified in accordance with Section 6. This requirement shall prevail, notwithstanding the incorporation by the Supplier of assembly components manufactured by others and notwithstanding whether or not a proposed component has been separately authorised as part of another (different) assembly submission by another supplier.

NOTES:

1. Natural rubber (NR) and ethylene propylene diene monomer (EPDM) are non-preferred elastomers for wastewater (sewage) applications – particularly in applications where continuously exposed to undiluted wastewater borne fluids, solids, oils and gases over a long service life (i.e. a typical life expectancy between 50 and 100 years).
2. ASTM C1628 (for concrete pipe) specifies more stringent elastomeric joint seal design and performance requirements than ASTM C443M (for concrete pipe and manholes) in terms of concrete joint dimensional tolerances, joint taper angles, intra-joint movement/deflection as well as elastomeric gasket dimensional tolerances and material mechanical characteristic.
3. Where the minimum specified requirement is for joint soil-tightness (but not water-tightness), joint seal performance in accordance with ASTM C443M (water-tight jointing) remains an acceptable, albeit more stringent, alternative to ASTM C990M (soil-tight jointing). Joint performance in accordance with ASTM C877M (external seal banding) may be considered for applications where soil-tightness but not water-tightness is required (e.g. where joint seal remedial/repair work on existing installations is required, subject to a supporting rational business justification).

3.5 Buoyancy Design Basis

The buoyancy balance of each type of precast concrete assembly (Type 6, 10, 40, 90, 180 and 350 pumping stations, associated chambers and valve pits as defined on the drawings) shall be analysed and designed for ultimate limit state load action combinations in accordance with AS 1170, with particular reference to AS 1170.0 Sub-clause 4.2. Analysis and design shall provide for installation in buried applications across WA irrespective of location. The design basis shall be sufficiently robust to obviate the need for project-specific geotechnical and buoyancy balance analyses at individual installation locations.

For acceptance, in the absence of individual access chamber assembly buoyancy balance checks on a project by project site basis, the following installation, geotechnical and site risk mitigation constraints shall apply:

1. Pre-cast concrete assembly mass and buoyancy up-thrust load balance shall be analysed for a range of installation depths (\leq permissible depth) and a given groundwater level condition (at finished surface level, for example), duly factored in accordance with the load and buoyancy design factors and soil surround boundary conditions required by DS 51;

NOTE: In most cases, the critical (or ‘worst’) load balance case is likely to occur at a chamber depth shallower than the maximum permissible (surface to invert level) depth for a given pre-cast structure type and size.

2. Reasonable (conservative) values shall be applied to or assumed for the physical properties including mass of component pre-cast concrete assembly materials;
3. Reasonable (conservative) values shall be applied to or assumed for the physical properties of (typically submerged) materials that pumping station and associated structures are likely to be embedded in or surrounded by, in accordance with DS 51 requirements. Reliance on a down thrust force contribution from a soil body other than that vertically above horizontal structure projections shall be limited to the conical soil boundary profile specified in DS 51;

NOTES:

Any assumption that an entire granular soil embedment mass (up to a conical profile angle \leq soil angle of internal friction, for example) can monolithically and uniformly resist pumping station buoyancy up-thrust forces in a predictable way is unsafe, given:

- The unpredictability of soil material classification, mechanical characteristics, compactibility and saturation (in groundwater) levels likely to be encountered across WA wastewater conveyance project sites into the future;
- The (unsafe) amount of upward structural movement required to activate a particular ‘down-thrust force contribution by surrounding soil embedment (\leq soil mass plus developed soil/structure friction) and the structural implications of such upward movement;
- In geotechnical practice, only a miniscule nominal upward structural movement is safely achievable if damage to the structure and its interconnected pipework is to be avoided. In practice also, a conical mass of granular soil is unlikely to behave monolithically (the larger the less likely) due to a multitude of ‘mini’ shear failures during an ‘uncontained’ uplift and is extremely unlikely to develop a down-thrust force that approaches full soil mass plus developed soil/chamber friction capability;
- The active soil/passive soil interface coefficient of frictional resistance f is, in practice, most unlikely to achieve a developed value in excess of 0.3 times the value of the measured internal soil friction angle ϕ , in common saturated and poor quality soil backfill environments.

For acceptance, the factored (0.9 times) self-weight of a pre-cast concrete assembly plus the weight of soil placed vertically above external assembly projections and the soil within the boundary limits specified in DS 51 shall exceed or equal the factored (1.2 times) buoyancy up-thrust force.

NOTE: The ultimate limit state safety factors (0.9, 1.2 or 1.5, as appropriate) should, wherever applied, be in conformity with the requirements of AS/NZS 1170.0 Clause 4.2.

3.6 Design for Durability

Precast concrete pumping station component durability shall be designed to deliver a service life substantially in excess of 50 years. The design, including concrete 28 day characteristic strength and cover to reinforcement, shall generally provide for the following exposure classifications in accordance with AS 3735:

- (a) Class D for all internal wet well and inlet chamber - including top slab soffit - surfaces;
- (b) Class B2 for all external wet well and inlet chamber surfaces; and
- (c) Class B2 for all internal and external valve pit surfaces.

The design of precast concrete pumping wet well and associated inlet components for the required product durability and longevity may include the provision of suitable means of isolating concrete and other corrodible components from extended exposure to highly corrosive environments (e.g. keyed-in lining/coating), as an alternative to unprotected concrete in conformity with AS 3735 requirements. Where a lining system is proposed for incorporation in pre-cast concrete components, its long term keying-in, adhesion and durability characteristics shall be capable of being verified by means of acceptable performance test methods together with proven past longevity performance in aggressive wastewater environments.

The adequacy of finished component (lined and unlined) design for durability shall be capable of being verified in accordance with Section 6 of this Specification including an acceptable inspection and test plan as described therein.

NOTE: The nominated design life of (lined and unlined) pre-cast systems should support a system life expectancy approaching 100 years for the required exposure classifications.

3.7 Materials

Concrete and reinforcing materials, cover to reinforcement and general material and construction requirements for pre-cast concrete pumping station components shall comply with AS 3735 Section 4 “Design for Durability” and Section 5 “Material and Construction Requirements” for the nominated

internal and external component surface exposure classifications. The specification and supply of concrete shall comply with AS 1379 and steel reinforcing materials for concrete shall be in conformity with AS/NZS 4671.

3.7.1 Reinforcement Configuration

Reinforced concrete component design shall provide for reinforcement in accordance with AS 3735. Concrete reinforcement shall be configured to facilitate achievement of the cover required by the specified durability design parameters. It shall also be configured for ease of fabrication, splicing, placement, fixing and retention in the required position during component manufacture. Reinforcement shall, at the time of concrete placement, be free of materials and coatings that could impair its bond with the surrounding concrete.

In accordance with AS 3735, neither the use of reinforcement with protective coating nor the achievement of concrete water absorption values less than 6.5% shall be an acceptable basis for reducing concrete cover to reinforcement.

3.8 Access Covers and Frames

Access covers and frames for wastewater pumping stations and for associated chambers and valve pits shall be configured to provide access clear opening sizes and arrangements for the safe:

- Installation, use and frequent opening/closing (or removal/replacement) of access safety grating;
- Placement, fixing and subsequent removal (e.g. for replacement purposes) of the required wet well/chamber/pit equipment;
- Access and egress by operations personnel for the purposes of operating, maintaining and repairing the equipment.

Typical access opening arrangements and details for pumping station types 6, 10, 40 and 90 are shown on the drawings referenced in Section 7/Appendix A. Access covers and frames for pumping station type 180 and 350 wet well and associated inlet/mobile pumping chambers shall be stainless steel type 316L with covers infilled with structural concrete. Typical arrangements and details for stainless steel access cover configurations may be adapted by reference to nominated example drawings. Access covers and frames for general purposes (no assisted lift) shall be in accordance with SPS 801. Assisted lift covers and frames shall, where specified, be in accordance with SPS 802.

In accordance with structural design basis requirements, all access cover and frame assemblies incorporated into pre-cast concrete wet well and associated (inlet) chamber and (valve) pit top slabs and surrounds shall be designed to safely bear an imposed ultimate limit state vehicular traffic design load of 240 kN.

A multi-part system of cover/lid components should span and be directly supported by a mating frame to preclude any need for (corrodible/unsafe) intermediate beam supports across person entry access openings.

NOTES:

1. Pending publication of standard and example drawings for pumping station types 180 and 350, access cover details may be developed/adapted from Drawings KE98-5-4-1, KE98-6-1-1, KE98-6-1-2 and KE98-6-2-1 (Type 180) and on IG53-4-1, IG53-5-4-1, IG53-6-1-1 and IG53-6-2-1 (Type 350) or otherwise by agreement on a project by project basis.
2. A key objective of precluding the use of intermediate cover support beams is to obviate the need for costly inspection and testing of concealed support/beam surfaces by structural experts at safe periodic intervals and to preclude potentially fatal collapses/failures of cover/beam assemblies over time. Any contribution to cover system load support that may arise by virtue of overlap between the under-cut and draw-cut profiles of cover/lid components should be duly validated by finite element analysis, engineering calculations and/or performance testing.
3. Access covers and frames that have been authorised for specific wastewater conveyance purposes, together with relevant conditions of authorisation, may be referenced in the Strategic Products Register.

4 Marking and Packaging

4.1 Marking

Each access chamber component shall be marked in accordance with the marking requirements of AS 4198 except that access cover/frame components shall be marked in accordance with the marking requirements of SPS 801 or SPS 802 (assisted lift) as appropriate or as may otherwise be agreed.

4.2 Packaging

Product shall be packaged with appropriate protection, which shall prevent damage or defects as a result of handling, storage or transportation. Flexible packaging material shall have a minimum expected life in outside storage conditions of 12 months from the date of delivery. Where requested in a Purchasing Schedule, each supplied item shall be identified by prominently and durably denoting the identification markings on the outside of any protective packaging.

4.3 Identification Marking

Wherever requested in a Purchasing Schedule, each supplied item shall be identified in a conspicuous position with the following information:

- a. Material Master Record number (MMR);
- b. Contract number; or
- c. Purchase order number.

5 Transportation, Handling and Storage

5.1 General

Transportation, handling and storage facilities shall be designed to prevent Product damage or defects and to maintain Product free of deleterious matter. Lifting elements shall be designed and installed in accordance with lifting element designer/supplier requirements in conformity with the requirements of the appropriate regulatory authority.

Product shall not be dropped off elevated vehicle platforms or sites. Mechanical handling equipment shall be in accordance with AS 2550.1, AS 2550.3, AS 2550.5 and AS 2550.11 and shall be appropriate to the loads to be lifted. Manual handling shall be in accordance with the National Standard for Manual Handling and the National Code of Practice for Manual Handling, published by National Occupational Health and Safety Commission, Australia. Product restraint during transportation shall be in accordance with Load Restraint Guide—Guidelines for Safe Carriage of Loads on Road Vehicles, published jointly by the Federal Office of Road Safety and the National Road Transport Commission, Australia.

NOTE: Lifting elements in direct contact with Product should be corrosion-resistant and should be installed so that reinforcement corrosion is not induced. They should preferably be of a non-abrasive design e.g. elastomeric or fabric webbing straps. During transportation, Product restraints should be checked for tension at regular intervals of travel and should not be released until the transporting vehicle is resting in a secure stable disposition on level ground.

Pre-cast concrete pumping station components shall be handled and stored so that component (wall and joint) serviceability, durability and water-tightness are not impaired and so that any type defects - as typically defined in AS 4198 – are acceptable or become acceptable after agreed repair procedures in general accordance with the repair principles of AS 4198.

5.2 Preservation of Product in Storage

Product shall be stored in original Product packaging in accordance with the published requirements of the manufacturer, prior to installation. Sensitive component materials shall be protected from extended exposure to direct sunlight and high temperatures e.g. elastomeric components shall be stored in accordance with the general principles of and guidance in AS 1646. Designated Product storage areas shall be of sufficient size to accommodate Product deliveries and shall be flat, reasonably level and free of combustible vegetation, sharp stones or projections that could cause Product damage or defects.

6 Conformity with Requirements

6.1 General

Product conformity with the specified requirements shall be verified by means of an acceptable inspection and test plan (ITP) in accordance with the “Table of Typical Conformity Inspection and Test Plan Requirements” in Section 8 Appendix B. The ITP shall provide for product component structural and durability design, materials control and performance conformance testing throughout production. The inspection and test plan shall be embodied in a duly accredited ISO 9001 production quality management system.

Product shall be deemed to conform with requirements where test outcomes have been formally verified by a Product Assessor or certified by a Conformity Assessment Body (CAB) in accordance with the requirements of a product standard acceptable to the Corporation. Otherwise, it shall be classified as non-compliant Product.

NOTE: For acceptance, performance testing and calibration laboratories should be accredited as meeting the requirements of AS/NZS ISO/IEC 17025 by a signatory member of the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). The scope of laboratory/facility accreditation should include the competencies and capabilities required to execute the particular product testing and calibration work to be undertaken.

6.2 Certification of Product

Products, in respect of which conformity with a particular nominated product Standard(s) is claimed, shall, for acceptance, be assessed in accordance with an acceptable product certification system and shall be subject to the issue of a certificate of conformity with the nominated Standard(s) by a duly accredited CAB.

The certification system or scheme with which product conformity is claimed shall:

- be based on ISO/IEC TR 17026, Conformity assessment -- Example of a certification scheme for tangible products and shall be in accordance with the fundamentals of AS/NZS ISO/IEC 17067 and with the guiding principles of ISO/IEC Guide 28;
- include product type testing from independently sampled production;
- require the manufacturer’s production processes and associated controls to be part of a quality management system that has been certified as meeting the requirements of AS/NZS ISO 9001, Quality management systems - Requirements; and shall
- include subsequent verification that the manufacturer routinely continues to maintain effective production control and product conformity with the nominated product Standard(s), at intervals not exceeding 12 months.

NOTE: Evidence of Product conformity with the specified requirements may be by means of a Product Verification Report provided by a Product Assessor including reference to a current relevant water industry appraisal report or certificate issued by WSAA.

6.3 Product Re-verification

Product conformity with the Specification shall be subject to re-verification by a Product Assessor when, during the agreed Product supply period, there occurs any:

- substantive change in Product design, material formulation or performance
- Product failure to perform in operational service to the nominated performance specification.

Re-verification shall require the issue of a new or supplementary Product Verification Report. Product components and test outcomes that are not significantly affected by the Product change or failure may be excluded from the scope of re-verification where already been reported in a current valid Product Verification Report that is acceptable to the Corporation.

6.4 Acceptance Criteria

For acceptance, Product shall be supplied as specified in the Purchasing Schedule.

Prior to the implementation of any arrangement to supply Product, the Supplier shall, in accordance with specified requirements:

- nominate applicable Product Warranty terms; and
- provide documentary verification in the form of a current valid Certificate, an acceptable inspection and test plan (ITP) or Product Verification Report as appropriate to the Product; and
- detail each element of Product that does not comply with the specified requirements together with the extent of non-compliance.

NOTE: Where the Specification includes Technical Compliance Schedules, the nature and extent of all non-compliances should be provided in accordance with the appropriate Schedules.

6.5 Non-compliant Product

6.5.1 General

Product whose design, workmanship or performance fails to conform to the specified requirements shall be clearly tagged and quarantined by the Supplier as non-compliant and shall be subject to rejection for return to and replacement by the Supplier.

6.5.2 Manufacturing Repairs (In-process)

The Manufacturer shall make provision in its production Quality System and in its ITP for sufficient hold points whenever Product defects are encountered. Production work on non-compliant components shall cease and repair work shall not re-commence until the following details have been confirmed by the Corporation in writing that:

- repair of the non-compliant components in lieu of their replacement is acceptable; and
- proposed repair procedures are acceptable; and
- any proposal to vary the terms of the original Product Warranty as a consequence of the in-process repair is acceptable.

6.5.3 Product Warranty

The Supplier shall replace non-compliant Product with Product that conforms to the acceptance criteria or shall repair or rectify all faults, damage or losses caused by defective Product. Except as may otherwise be specified, the Product Warranty shall indemnify and keep indemnified the Corporation against all losses suffered by the Corporation as a result of non-compliant Product for a period no less than 24 months after Product delivery or 12 months after Product installation, whichever period elapses first.

6.5.4 Product Repair

All reasonable proposals for repair or remedy of defects will be considered, provided that each proposal is accompanied by a methodology statement that accords with the performance objectives of this Specification, as determined by the Corporation. For acceptance, a proposal for repair or remedy of Product defects shall not void or otherwise diminish the provisions of the Product Warranty.

6.6 Access to the Place of Manufacture

The Corporation shall be afforded access, at all reasonable times, to all places of manufacture of Product and shall be authorised to arrange or undertake such testing there as the Corporation deems appropriate to the agreed design proving or testing regime.

7 Appendix A: Reference Drawings (Informative)

The following drawing lists have been extracted from the standard and example drawing lists that are associated with the requirements of design standard DS 51 in order to illustrate configuration and structural concepts for typical pre-cast concrete access chambers and valve pits in Corporation wastewater and drainage applications. The use of pre-cast concrete components in accordance with SPS 700 “Precast RC Access Chambers” may be considered for Type 6 and Type 10 wastewater pumping station applications and for appurtenant chambers and pits associated with other pumping station types, where chamber/pit diameters do not exceed 1800 mm. Applicable current standard and example drawing detail requirements should be established solely by reference to the current version of DS 51.

DS 51 - Design and Construction of Wastewater Pumping Stations & Pressure Mains (4 to 180 l/s capacity)	
DRAWING	TITLE
CA01-5-3	Type 40 Pumping Stations And Smaller Emergency Overflow Details
CA01-5-4	Type 90 Pumping Stations - Emergency Overflow Details
CA01-5-5	Pumping Stations With Pump Rate Not Exceeding 14L/S, Emergency Overflow Details – Bubble Up Access Chamber Discharge
TYPE 6 PUMPING STATION	
CA01-8-1	Type 6 Pumping Station - General Arrangement And Details
TYPE 10 PUMPING STATION	
CA01-9-20	Type 10 Pumping Station - No Valve Pit - General Arrangement
CA01-9-21	Type 10 Pumping Station - No Valve Pit - General Arrangement – Decontactor
CA01-9-22	Type 10 Pumping Station - No Valve Pit - Structural Details – Precast Components
CA01-9-23-1	Precast Slab And Cover – Temporary Guardrail System
CA01-9-23-2	Precast Slab And Cover – Permanent Guardrail System
CA01-9-27	No Valve Pit - Structural Details – Precast Components - Decontactor
CA01-9-29	Grating Arrangement And Notes
TYPE 40 PUMPING STATION (DN 150 pipework with valve pit)	
CA01-10-2	General Arrangement - DN150 Pipework
CA01-10-5	Structural Details - Precast Components
CA01-10-6-1	Precast Slabs And Covers – Temporary Guardrail System
CA01-10-6-2	Precast Slabs And Covers – Temporary Guardrail - Reinforcement
CA01-10-6-3	Precast Slabs And Covers – Permanent Guardrail System
CA01-10-6-4	Precast Slabs And Covers – Permanent Guardrail - Reinforcement
TYPE 40 PUMPING STATION (DN 100 pipework without valve pit)	
CA01-10-20	General Arrangement – DN100 Pipework
CA01-10-21	Structural Details – Precast Components
CA01-10-22-1	Precast Slabs And Covers – Temporary Guardrail System
CA01-10-22-2	Precast Slabs And Covers – Permanent Guardrail System
TYPE 40 PUMPING STATIONS (with electrical decontactor, DN 150 pipework and valve pit)	
CA01-15-3	Structural Details - Precast Components
CA01-15-8	Type 40 Pumping Station with Electrical Decontactor 22Kw To 37Kw - General Arrangement – DN150 Pipework
TYPE 40 PUMPING STATION (with electrical decontactor, DN100 pipework and without valve pit)	
CA01-15-20	Electrical Decontactor Up To 22Kw - General Arrangement No. 1 – DN100 Pipework
CA01-15-21	Electrical Decontactor 22Kw To 37Kw - General Arrangement No. 2 – DN100 Pipework
CA01-15-22	Structural Details – Precast Components
TYPE 90 PUMPING STATIONS	
CA01-20-1-1	Pump Well Cast Insitu – General Arrangement – Sheet 1 Of 2
CA01-20-1-2	Pump Well Cast Insitu – General Arrangement – Sheet 2 Of 2
CA01-20-3	Pump Well Cast Insitu – Structural Details
CA01-20-5	Pump Well Cast Insitu – Reinforcement Details
CA01-20-7-1	Valve Pit Cast Insitu – Structural And Reinforcement Details
CA01-20-7-2	Valve Pit – Circular – Precast Slab And Covers – Structural Details – Temporary Guardrail System
CA01-20-7-4	Valve Pit – Circular – Precast Slab And Covers – Structural Details – Permanent Guardrail System
CA01-20-8-1	Pump Well – Top Slab With Temporary Guardrail System - Arrangement
CA01-20-8-3	Pump Well – Top Slab With Permanent Guardrail System - Arrangement
CA01-20-9	Pump Guide Rail Support, Lifting Chain Hook & Lifting Chain Details

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SPS 702 - Pre-cast Concrete Wastewater Pumping Stations

CA01-20-17	Inlet Access Chamber Details
CA01-20-20-1	Pump Well Precast – General Arrangement- Sheet 1 Of 2
CA01-20-20-2	Pump Well Precast – General Arrangement- Sheet 2 Of 2
CA01-20-21-1	Pump Well And Valve Pit Precast – Structural
CA01-20-23	Temp & Perm Guardrail System – Grating Arrangement & Notes

8 Appendix B: Table of Inspection and Test Plan Requirements (Normative)

Pre-cast Reinforced Concrete Pumping Station Component Testing Plan (for conformity with SPS 702/AS 4198)									
No.	Test characteristic	Test method reference	Precast Component routine test frequency	Pumping Station and associated Chambers and Pits					
				Shaft Section/Liner		Precast Base (Note 6)		Top Slab (Note 7)	
				TT	RT	TT	RT	TT	RT
1	Ultimate load (240 kN) – Refer Note 1 to prove precast concrete component design basis prior to production by determining ultimate or failure load-carrying capacity.	AS 4198 Appendix C (as guiding principles)	Once	R	N/A	R	N/A	N/A	N/A
2	Proof load (120 kN) – Refer Note 1 to verify conformity of precast concrete component with design basis load-carrying requirements capacity during production.	AS 4198 Appendix C (as guiding principles)	1st product then 1 in 200 or > 1 per 2 production months	R	R	R	R	N/A	N/A
3a	Cover (AS 3735 Tables 4.2/4.3) – Purpose pre-cast component – Refer Note 2 to verify conformity of precast concrete component cover to reinforcement with requirements.	AS 4198 Appendix D (as guiding principles)	1st product then 1 in 200 or > 1 per 2 production months	R	R	R	R	R	R
3b	Cover (AS/NZS 4058 Table 3.1) AS 4058 pipe component – Refer Note 2	AS 4058 Appendix G	1st product then 1 in 200 or > 1 per 2 production months	R	R	N/A	N/A	N/A	N/A
4a	Water absorption (< 6.0%) - Purpose pre-cast component – Refer Note 3 to verify resistance of precast concrete component to water absorption.	AS 4198 Appendix E (as guiding principles)	1st product then 1 in 200 or > 1 per 2 production months	N/A	N/A	R	R	N/A	N/A
4b	Water absorption - AS 4058 pipe component – Refer Note 3	AS 4058 Appendix F	> 1 per concrete mix design per 2 months	N/A	R	N/A	N/A	N/A	N/A
5a	Hydrostatic Test of Shaft Section - Purpose pre-cast component – Refer Note 4 to verify resistance to internal hydrostatic pressure without failure	AS 4198 Appendix F (as guiding principles)	1st product then 1 in 200 or > 1 per 2 production months, subject to an absolute min of 4 P/A	R	R	N/A	N/A	N/A	N/A
5b	Hydrostatic Test of Shaft Section - AS 4058 pipe component – Refer Note 4	AS 4058 Appendix D	1st product then 1 in 200 or > 1 per 2 production months, subject to an absolute min of 4 P/A	R	R	N/A	N/A	N/A	N/A
6a	Hydrostatic testing of joint assembly – Refer Notes 5/6 to verify resistance of assembled precast concrete component joint to external hydrostatic pressure without failure.	AS 4198 Appendix G (as guiding principles)	1st product then 1 in 200 or not less than 1 per production month Test assembly comprising mating shaft/base components.	R	R	R	R	N/A	N/A
6b	Joint assembly testing of elastomeric seal jointed pipes – Refer Notes 5/6 to verify pipe assembly joint dimensional fit within tolerances.	AS/NZS 4058 Appendix H	1st product then 1 in 200 or not less than 1 per production month Test assembly comprising mating (AS/NZS 4058) pipe/base components.	R	R	R	R	N/A	N/A
7	Dimensional accuracy to verify precast concrete component dimensional conformity with requirements. The tolerance in the dimensions of each component shall not exceed the appropriate tolerance given in Table 5.1 when measured in accordance with clause 5.3	AS 4198 Clause 3.3 (as guiding principles plus relevant top slab arrangement drawings)	1 in 200 or ≤ 1 per 2 production months	R	R	R	R	R	R
8	Workmanship and finish	AS 4198 Clause 3.7 (as guiding principles)	Each component	R	R	R	R	R	R
9	Verification of design and material conformity with requirements - Refer Note 8	Documents/Drawings	Once - Type assembly of all components including all joint seal specifications	R	N/A	R	N/A	R	N/A

TT = Type (System Design Proof) Testing
RT = Routine (Production Batch Release) Testing

R = Required
N/A = Not Applicable

NOTES:	
1	Evidence of pre-cast base “ultimate” and “proof” load capacity conformity with requirements which may, as an alternative to type and routine test records, be by the provision of (documented) supporting design basis engineering and calculations as described in Note 8. Note load requirements are 240/120 (not 210/105 kN) in accordance with current AS 5100 (Bridge design standard) wheel loading requirements.
2	Evidence of pumping station wet well or associated chamber or pit pre-cast component conformity with cover to reinforcement requirements shall be provided, irrespective of whether the component (e.g. shaft section) is manufactured/tested in accordance with AS 4198, AS/NZS 4058 or other appropriate product standard. This evidence is required to assure the Corporation of ongoing component design (type) and production (routine) conformity with requirements.
3	Evidence of pumping station wet well or associated chamber or pit component conformity with water absorption requirements shall be provided, irrespective of whether the component is manufactured/tested in accordance with AS 4198, AS/NZS 4058 or other standard. This evidence is required to assure the Corporation of conformity with requirements and may include tests on samples from components to be destructively tested and cored – particularly where water absorption testing of finished components produced for commercial sale may prove impracticable (e.g. integrally plastics-lined components).
4	Evidence of pumping station wet well or associated chamber or pit component conformity with resistance to internal pressure requirements shall be provided, irrespective of whether the component is manufactured/tested in accordance with AS 4198, AS/NZS 4058 or other product standard. This evidence is required to assure the Corporation of ongoing component design (type) and production (routine) conformity with requirements. A water absorption requirement for the concrete components ($\leq 6\%$) - lower than the upper (6.5 %) value in AS 4198 for access chambers) - aligns with design for durability requirements and, coincidentally, with AS/NZS 4058 requirements where shafts are formed from RC pipe.
5	Evidence of mating shaft to shaft and shaft to precast base joint integrity (joint conformity with dimensional and pressure-tightness/seal requirements) shall be provided, irrespective of whether the component is manufactured/tested in accordance with AS 4198, AS/NZS 4058 or other product standard. This evidence is required to assure the Corporation of ongoing component assembly design conformity with requirements.
6	Pre-cast base units typically comprise an integral shaft section, structural base and, sometimes, benching. Evidence of base unit structural and water-tightness integrity (conformity with load bearing and resistance to internal pressure requirements) shall be provided, given that the base component is the lowermost load bearing/water retaining structure with the greatest exposure to failure consequences in the event of structural or water-tightness defects.
7	Top slab conformity with cover to reinforcement requirements shall be verified in accordance with AS 3735 as specified under “Design for Durability”, using the test method in AS 4198 Appendix D for purpose cast components or AS/NZS 4058 Appendix G where RC pipe is accepted as an integral shaft component. Top slab dimensions shall conform to the nominal dimensions specified in the relevant standard and example drawings ± 5 mm except as may otherwise be agreed.
8	A supplier who elects to offer a pre-cast pumping station wet well or associated chamber or pit assembly for acceptance/authorisation by the Corporation shall provide documentary evidence of component conformity with performance requirements, whether or not sourced from a third party supplier/manufacturer of another (different) authorised assembly. Evidence of product conformity with specified requirements may include finite element analyses and should include signed drawings and supporting engineering design/calculations as appropriate.

9 Appendix C: Material Master Records (Informative)

The following Material Master Records (MMR) comprise Corporation catalogue numbers that are unique to the particular products described for the purposes of Corporation activities or work.

NOTE: Allocation of MMR numbers are not proposed for this product, at this stage.

END OF DOCUMENT