SA Water

Engineering

Technical Standard

TS 0104 – Technical services management

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Government of South Australia

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Documents superseded by this standard

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Significant/major changes incorporated in this edition

This edition represents a substantial revision to broaden the Standard from design quality management to the management and assurance of Technical Work.

Key changes include revised roles, accountabilities and assurance requirements; updated Engineering Panel capability requirements; revised land development consultant and superintendent approval, performance assessment and rating requirements; separate requirements for Design Workstreams and Technical Consulting Workstreams; strengthened design planning, review, verification, progression, milestone acceptance, interface and change-management requirements; introduction of the Equipment Procurement Exception Form; and updated figures, tables and supporting forms.

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1 Introduction

This Technical Standard establishes SA Water's requirements for the management and assurance of technical services supporting SA Water infrastructure.

For the purposes of this Technical Standard, these services are referred to as Technical Work and comprise:

- Design Workstreams; and
- Technical Consulting Workstreams.

Technical Work shall be undertaken by competent and experienced personnel and be subject to quality management, review and verification appropriate to its nature, complexity and technical risk.

1.1 Purpose

The purpose of this Technical Standard is to ensure that Technical Work undertaken for SA Water:

- is appropriately planned, managed and assured;
- produces technically sound outcomes that are fit for purpose and satisfy SA Water's Project Requirements; and
- has clear roles, responsibilities and accountabilities.

This Technical Standard applies to Technical Work undertaken for SA Water infrastructure, including infrastructure intended to transfer to SA Water ownership. The requirements are structured as follows:

- Section 4: General requirements for Technical Work
- Section 5: Design requirements – land development
- Section 6: Delivery requirements – SA Water projects

1.2 Glossary

Terms and Abbreviations utilised in this Standard are included in the following sections. The definitions presented below are to be used when interpreting this Standard and actions undertaken in relation to this Standard. Where a conflict exists, clarification is to be sought from SA Water.

1.2.1 Terms and Definitions

The following is a list of Terms applicable to this document:

Term	Description
Accepted	Determined to be satisfactory by SA Water's Representative.
Agent	Person or organisation that engages a Consultant to undertake a Design Workstream or Technical Consulting Workstream.
Allow	Means that the cost of the item referred to is the responsibility of the Constructor.
Approved Consultant	Consultants whose design activities are typically undertaken for works delivered under a DAFI.
Approved Superintendent	Authorised under a DAFI agreement to support an effective quality assurance process during construction of infrastructure to be transferred to SA Water by proactively managing risk and working with Constructors to ensure delivery of infrastructure that satisfies SA Water's requirements.

Term	Description
Author	An individual responsible for developing a technical deliverable for a Technical Consulting Workstream.
Authoriser	An individual working for or on behalf of the Consultant and responsible for confirming that the applicable quality assurance, review and verification activities for a deliverable have been completed before final issue.
Constructor	The organisation responsible for constructing and installing infrastructure for SA Water.
Consultant	An organisation providing engineering design or technical consulting services for SA Water infrastructure. References to Consultant apply to both Design Workstreams and Technical Consulting Workstreams.
Consulting Management Plan	A document establishing how a Technical Consulting Workstream will be planned, coordinated, reviewed, verified and accepted.
Contract	A set of documents supplied to the Constructor as the basis for construction; these documents contain contract forms, contract conditions, specifications, drawings, addenda, and contract changes.
Design Consultant	A Consultant responsible for undertaking Design Workstreams and the associated design management and assurance activities. References to Design Consultant apply to these accountabilities for the design work undertaken, not to a separate category of panel membership.
Design Management Plan	A document establishing how a Design Workstream will be planned, coordinated, assured and delivered.
Design Manager	The individual responsible for coordinating the technical delivery of an engagement, including the applicable workstreams, technical interfaces, stakeholders, deliverables and assurance activities. The specific accountabilities of the Design Manager depend on the organisation for which the role is performed and do not alter the accountabilities assigned to the Agent, Consultant, Design Consultant, Owner's Engineer or other roles under this Technical Standard.
Design Milestone Acceptance	SA Water's formal acceptance of final design deliverables before their release for construction, recorded through a Design Milestone Acceptance Certificate.
Design Review Gate	A hold point at a defined stage of design development at which design deliverables are submitted to SA Water for review before the design progresses.
Design Workstream	Technical Work undertaken for the purpose of developing, modifying or verifying a design solution.
Designer	An individual who effects design, produces designs or undertakes design activities for SA Water infrastructure. Designer has the meaning given in the *Work Health and Safety Act 2012 (SA)*.
Drawing	A document intended to provide sufficient technical information in detail about the work to be constructed, and to provide a record of works undertaken.
High Voltage	Greater than or equal to 1000 VAC or 1500 VDC
Hold Point	A mandatory point beyond which the applicable activity shall not proceed until the nominated submission has been accepted or the hold point has otherwise been formally released.
Inspection	Measuring, testing or examining of Works, materials or goods or services (includes raw materials, components and intermediate assemblies) for determining conformity with the Requirements.
Inspection and Test Plans	The planned inspections and tests for individual work processes or activities.

Term	Description
Low Voltage	Less than 1000 VAC or 1500 VDC
Manufacturer	A person, group, or company that owns and operates a manufacturing facility that provides materials for use in SA Water infrastructure.
May	Indicates permission to undertake an action, subject to any stated conditions, or the possibility of an event or outcome, depending on the context.
Must	See 'Shall'
Non-Conformance Report	A report documenting a non-conformance, its root cause, corrective and preventive actions, responsible parties, implementation timeframes and evidence of closure.
Owner's Engineer	Engaged by SA Water to protect SA Water's interests by ensuring works progress in accordance with SA Water's Project Requirements.
Principal	As defined in SA Water's Developer Agreement Formal Instrument.
Project Sponsor	Asset planner accountable for ensuring a project is governed effectively and delivers outcomes that achieve the required level of service.
Provide	Means "supply and install".
Representative	The applicable representative for the work, being: • For Works delivered under an executed Developer Agreement Formal Instrument (DAFI), the Approved Superintendent. • For works delivered directly for SA Water under a contract or other engagement, the SA Water Representative.
Requirement	Need or expectation that is stated within the Contract.
Responsible Discipline Lead	The engineering discipline expert identified in the 'Approvers' table (via SA Water's Representative).
Reviewer	An appropriately qualified and experienced individual working for or on behalf of the Consultant and responsible for undertaking the Consultant's internal review of technical deliverables prepared as part of the Technical Work.
SA Water Engineering Panel Manager	The SA Water representative with delegated authority to manage SA Water's Engineering Panel.
SA Water Project Requirements	Documents specifying SA Water's requirements for a project or engagement, including applicable Technical Governance requirements.

SA Water Representative	The SA Water representative with delegated authority as follows:
	• For works under a Contract or engagement with SA Water:
	  ○ Superintendent's Representative (for example, AS 4300 and AS 2124).
	  ○ SA Water Project Manager.
	  ○ SA Water nominated contact person.
	• For works to be delivered via a Developer Agreement Formal Instrument (which has not yet been executed):
	  ○ SA Water Account Manager

Shall	Indicates a mandatory requirement for compliance with this Technical Standard.
Should	Indicates a recommended practice that is not mandatory.
Supplier	A person, group or company providing goods or services for use in SA Water infrastructure. This includes organisations engaged under SA Water's Engineering or Automation Panels.

Term	Description
Technical Consulting Workstream	Technical Work undertaken to provide information, analysis, advice, recommendations, requirements or specifications to support decision-making, procurement, asset management or future design activities.
Technical Deliverable	A document, information set or other technical output produced through a Design Workstream or Technical Consulting Workstream. Technical Deliverables may include, but are not limited to: • design drawings, specifications and hazard registers; • calculations and modelling outputs; • investigations and assessments; • technical reports, advice and recommendations; and • technical requirements or specifications supporting procurement, decision-making or future design activities.
Technical Dispensation Request Form	This form is part of SA Water's Technical Dispensation Request Procedure which details the process by which those required to comply, or ensure compliance, with SA Water's technical requirements may seek dispensation from those requirements.
Technical Governance	SA Water's primary method for articulating required technical outcomes to stakeholders, usually via Technical Standards, Standard Drawings etc.
Technical Work	Engineering or other technical activities undertaken for SA Water infrastructure that are classified under this Technical Standard as either a Design Workstream or a Technical Consulting Workstream.
Verifier	An appropriately qualified and experienced individual working for or on behalf of the Consultant and responsible for undertaking verification of technical deliverables prepared as part of the Technical Work, where verification is required by this Technical Standard, the approved DMP or the accepted CMP.
Witness Point	A mandatory notification or evidence-submission point that provides the nominated party an opportunity to review or witness the applicable activity but does not prevent progression unless otherwise stated.

1.2.2 Abbreviations

The following is a list of Abbreviations, Acronyms and Initialisms used in this document:

Term	Description
ACR	Asset Criticality Rating (refer TS 0109)
AS	Australian Standard
ANCOLD	Australian National Committee on Large Dams
BAL	Bushfire Attack Level
CDR	Concept Design Report
CFD	Computational Fluid Dynamics
CHAZOP	Control System Hazard and Operability
CMP	Consulting Management Plan
CP	Cathodic Protection
CPEng	Chartered Professional Engineer
CLoS	Customer Level of Service
CV	Curriculum Vitae
D&C	Design and Construct

Term	Description
DA	Development Application
DMAC	Design Milestone Acceptance Certificate
DAFI	Developer Agreement Formal Instrument
DBR	Design Basis Report
DCP	Design Change Proposal
DDR	Detailed Design Report
DMP	Design Management Plan
ECI	Early Contractor Involvement
EPEF	Equipment Procurement Exception Form
EPA	Environment Protection Authority
ESCOSA	Essential Services Commission of South Australia
FEA	Finite Element Analysis
HAZOP	Hazard and Operability
HV	High Voltage
ID	Internal Diameter
IFC	Issued for Construction
ITP	Inspection and Test Plan
LV	Low Voltage
NCR	Non-conformance Report
OE	Owner's Engineer
PAC	Powdered Activated Carbon
PCB	Polychlorinated Biphenyls
QA	Quality Assurance
QMP	Quality Management Plan
QMS	Quality Management System
RFI	Request for Information
RPEng	Registered Professional Engineer
SA Water	South Australian Water Corporation
SCADA	Supervisory Control and Data Acquisition
SDCP	Significant Design Change Proposal
SiD	Safety in Design
TDRF	Technical Dispensation Request Form
TG	SA Water Technical Guideline
UV	Ultraviolet
TLoS	Technical Level of Service
TS	SA Water Technical Standard
VAC	Volts Alternating Current
VDC	Volts Direct Current
WHS	Work Health and Safety
WSAA	Water Services Association of Australia

1.3 References

1.3.1 Australian and International

The following table identifies Australian and International standards and other similar documents referenced in this document:

Reference	Title
	Work Health and Safety Act 2012 (SA)
	Work Health and Safety Regulations 2012 (SA)
AS/NZS ISO 19011	Guidelines for Auditing Management Systems
AS/NZS ISO 9001	Quality Management Systems

1.3.2 SA Water Documents

The following table identifies the SA Water standards and other similar documents referenced in this document:

Reference	Title
SAWT-ENG-0015	SA Water technical dispensation request procedure
SAWG-ENG-0521	Major land developments safety in design management plan
SAW-PR-0006	Procurement and contract management procedure *(internal SA Water use only)*
SCM	Sewer construction manual
TS 0100	Requirements for technical drawings
TS 0101	Safety in design
TS 0105	Quality requirements
TS 0106	Temporary works (when published)
TS 0107	Sustainability by design
TS 0109	Infrastructure design
TS 0110	Durability design
TS 0130	As constructed data requirements for linear assets
TS 0132	Operation and maintenance manuals
TS 0134	Requirements for automated assessment
TS 0136	Pipework access and protection
TS 0400	SA Water supplement to the Manual for Selection and Application of Protective Coatings: WSA 201
TS 0523	Preparation of design drawings for reticulation infrastructure (when published)
TS 0530	Temporary sewage storage facilities
TS 0854	Odour and corrosion
TS 0900	Pressure testing of pipelines
WSCM	Water Supply Construction Manual

2 Scope

The scope of this Technical Standard is to establish SA Water's minimum requirements for the management and assurance of Technical Work undertaken for SA Water infrastructure, to ensure that the resulting technical outcomes:

a. Are safe and support SA Water's obligations under applicable work health and safety legislation;

b. Comply with applicable legislation, regulations, standards and State Government policy;

c. Satisfy the performance requirements and outcomes specified in SA Water's Project Requirements; and

d. Support the outcomes expected by SA Water's customers, regulators and key stakeholders, including applicable CLoS and TLoS requirements.

This Technical Standard defines:

- Requirements for the management and assurance of Technical Work;
- The roles, responsibilities and accountabilities of parties involved in Technical Work;
- Competency requirements for personnel preparing, reviewing, verifying and authorising technical deliverables;
- Requirements for the planning, review, verification, authorisation and acceptance of technical deliverables;
- Specific delivery requirements for Design Workstreams and Technical Consulting Workstreams;
- Escalation pathways for unresolved technical issues and review comments; and
- Requirements for the identification and management of non-conformances.

Unless expressly stated otherwise, or varied through an approved TDRF, this Technical Standard applies to all Technical Work undertaken for SA Water infrastructure.

2.1 Exclusions

The following are excluded from the scope of this Technical Standard:

a. Designs undertaken by SA Water employees for network alterations delivered **strictly** in accordance with SA Water's WSCM and SCM drawing sets (namely minor third party works or extension and connection designs)

b. Legislative/Statutory/Planning approvals

c. Commercial, schedule and general project-management risk assessments that do not constitute Technical Work.

d. Commissioning requirements or procedures (excepting the role of the Designer).

e. Design of temporary works (refer TS 0106)

f. The technical content and level of detail required for individual deliverables, except where specifically prescribed by this Technical Standard.

2.2 Technical dispensation

Departure from a requirement of this Technical Standard requires an approved Technical Dispensation Request in accordance with SA Water's Technical Dispensation Procedure, unless this Technical Standard expressly provides otherwise. TDRFs are evaluated on a case-by-case basis subject to the following requirements:

a. The Agent shall not engage a Consultant to undertake Technical Work outside the applicable SA Water Panel or the Consultant's nominated capability area unless authorised through an approved TDRF.

b. A Consultant shall not incorporate or rely on a known departure from SA Water's requirements in a technical deliverable until the departure has been authorised through an approved TDRF.

c. The use of companies other than SA Water's Approved Consultants or Approved Superintendents for works delivered via a DAFI is not permitted. Dispensation requests to use companies not listed as an SA Water Approved Consultant or Approved Superintendent will not be accepted.

SA Water requires sufficient information to assess dispensation requests and their potential impact. The onus is therefore on the proponent to justify dispensation request submissions and provide suitable evidence to support them.

Technical Work undertaken without the required SA Water approval may be rejected by SA Water and may require retrospective review, rectification or re-performance by the Consultant, at the Consultant's cost.

3 Consultants and SA Water Panels

Consultants play an essential role in the development of engineering designs and provision of technical services supporting works on SA Water infrastructure.

For Design Workstreams, the applicable design delivery arrangements shall be determined in accordance with Table 1 and Table 2. For Technical Consulting Workstreams and other technical services provided through SA Water's Panels, the appropriate Supplier shall be selected based on the capability areas defined in Table 4.

Table 1: Engineering design matrix

Project type	Engineering design by
SA Water capital	SA Water panel/s
SA Water operational	SA Water panel/s
Land development	Refer Table 2

Table 2: Land development design matrix

Infrastructure Type(1)	Approved Consultant(2)	SA Water Panel Suppliers(3)
Standard infrastructure(4)	Permitted	Not permitted(5,6)
Non-standard infrastructure(7)	Not permitted	Permitted

Notes:

1) Including single or multi-stage developments
2) Refer Section 5.2.
3) SA Water's Engineering or Automation Panel, as applicable.
4) Standard infrastructure includes:
   a. Drinking and non-drinking water networks with ID ≤ 375 mm (inc. highway, creek, and rail crossings)
   b. Gravity sewer networks with ID ≤ 300 mm (inc. highway, creek, and rail crossings)
   c. Pressure sewer mains with ID ≤ 250 mm (inc. highway, creek, and rail crossings)
   d. Wastewater pumping stations with a design flow rate of ≤ 50 L/s.
   e. Connections to existing gravity sewer pipelines with ID ≤ 300 mm, including existing maintenance holes (unless excluded by note 7)
   f. Connections to drinking and non-drinking water mains with ID ≤ 375 mm (unless excluded by note 7)
   g. Temporary sewage storage facilities designed in accordance with TS 0530
5) Suppliers listed on SA Water's Engineering Panel, who are also Approved Consultants, may design standard infrastructure in land development projects.
6) Excluding third-party verification where required in accordance with Section 4.3.5.1.
7) Non-standard infrastructure is defined as:
   a. All infrastructure not specifically identified in note 4 above
   b. Connections to major or trunk infrastructure (per definition in TS 0136)

3.1 SA Water panels

SA Water engages Suppliers through structured panel arrangements to ensure quality, consistency and alignment with infrastructure standards and technical requirements.

SA Water maintains two panels to provide technical services — an **Engineering Panel** and an **Automation Panel** — in which companies have been evaluated via a formal procurement process to confirm their capability to deliver designs and services of a high standard to SA Water.

Suppliers on these panels may only be engaged to provide services that fall within both the scope and capability area for which the panel was established. Engagement of panel members to work outside these boundaries requires submission and approval of a TDRF prior to their being engaged.

Compliance with this Technical Standard is a requirement for becoming and remaining a member of SA Water's panels. SA Water reserves the right to audit a Supplier at any time to monitor performance against this Technical Standard.

3.1.1 Engineering panel

To support consistent alignment between technical complexity and Supplier capability, SA Water has established a structured Engineering Panel with defined capability areas. These provide a risk-based approach to engaging technical capability while supporting SA Water's diverse infrastructure programs.

Suppliers shall be engaged in accordance with Table 3 and within the applicable capability area defined in Table 4, having regard to the infrastructure type, technical service or subject-matter expertise required.

Capability area definitions, as outlined in Table 4, shall be:

- Used with the infrastructure types as a practical guide for determining the appropriate capability area. The examples are indicative and not exhaustive; and
- Read **alongside** the accompanying explanatory notes.

Table 3: Engineering Panel Capability Service Areas

Supplier	Capability Areas[1]						
	General		Specialist				
	Major	Minor	Dams	Process	CP	Systems Planning	Environment
AECOM							X
Aurecon	X		X	X	X		X
Corrosion Control Engineering					X		
Fyfe[2]		X			X		
GHD+[2]	X		X	X		X	
GPA[2]		X					
Jacobs	X			X		X	X
Mott Macdonald	X		X				X
SMEC	X		X				
Tonkin & Stantec[2]		X				X	
WSP	X			X		X	

Notes:

1) Capability areas as defined in Table 4
2) Supplier comprising a commercial partnership between two or more Consultants, limited to services within its approved capability area.

Table 4: Capability Area Definitions

Capability Area	Overview	Scope[1,2]
MAJOR[3]	Broad, multidisciplinary engineering capability and integration for technically complex or bespoke water and wastewater infrastructure. Core engineering disciplines: • Structural • Civil • Materials Science • Hydraulics • Electrical • Mechanical • Geotechnical[14]	Design of infrastructure requiring multidisciplinary capability due to technical complexity, integration needs, or design risks. Included infrastructure: • Treatment plant rehabilitation[4] • Major/trunk pipelines[5], including appurtenant infrastructure (surge vessels, valves and associated infrastructure) • Pump stations • Tanks • Earth bank storages[6] • Dam infrastructure[6] • Coating system renewals/replacements • Project-specific hydraulic modelling • High voltage infrastructure[7]

MINOR	Multidisciplinary capability for lower complexity infrastructure requiring limited design integration.
	
	Core engineering disciplines:
	• Structural
	• Civil
	• Mechanical
	• Electrical
	• Geotechnical
	• Building Services
		Design of infrastructure requiring reduced multidisciplinary capability for low to moderate complexity works.
		
		Included infrastructure types:
		• Standard Infrastructure defined in Table 2
		• Buildings, including:
		  ○ Upgrades/Renovations
		  ○ Building services
		  ○ Ventilation/cooling systems
		• Roads/Hardstands
		• Switchboards[8]
		• Stormwater systems
		• Safe access infrastructure
		• Levees
		• Retaining walls
		• Plinths/Slabs supporting electrical infrastructure
		• Minor mechanical upgrades[9]

DAMS	Specialised multidisciplinary capability for dam infrastructure and dam safety. Core engineering disciplines: • Dams • Structural • Civil • Mechanical • Geotechnical	Design of dam infrastructure requiring specialised multidisciplinary input due to technical complexity, integration needs, and design risk. Provides specialised capability in: • Dam inspections • Dam safety (including risk assessments) • Hydrology • Seismology Included infrastructure: • Dams/earth bank storages with ANCOLD consequence category of Significant–Extreme • Appurtenant dam infrastructure with dam safety implications
CATHODIC PROTECTION	Specialised capability in cathodic protection systems.	Provides specialised capability in design, testing, commissioning, and reporting for cathodic protection in water/wastewater infrastructure.

Capability Area	Overview	Scope[1,2]
PROCESS	Specialised capability for process and treatment infrastructure design.	Design of treatment plants, process and odour infrastructure requiring specialised capability in: • Treatment process upgrades • Membrane treatment • Ozonation • H_2S modelling and design of mitigation infrastructure • Recycled water process/treatment design • Computational fluid dynamics • Chemical Dosing • UV treatment • Disinfection • Sludge management processes
SYSTEMS PLANNING[10]	Specialised capability in strategic hydraulic system modelling for water, recycled water and wastewater Core technical capability: • Hydraulic Engineering • Network Modelling • System Planning	Specialised capability in: • Corporate model maintenance, including model enhancements and calibration expertise • Systems performance analysis • Growth/augmentation planning
ENVIRONMENT[11,12]	Specialised capability in land use planning, environmental assessment and approvals	Specialised capability in: • Land use planning • Environmental impact assessments • Native vegetation assessments • Water sensitive urban design • Site contamination assessments[13] • Spoil and soil investigation / classification • Environmental auditing • Environmental approval support • Asbestos and PCB assessments

Notes:

1) Technical services relating to infrastructure rehabilitation shall be delivered within the capability area applicable to the infrastructure or subject matter.
2) Services within other capability areas are excluded unless otherwise stated.
3) Suppliers approved for the Major capability area may also deliver services within the Minor capability area.
4) Process functionality shall not change as part of rehabilitation works.
5) As defined in TS 0136
6) Excludes scope that meets the criteria of the Dams capability area.
7) High voltage infrastructure shall be delivered by the Automation Panel or Suppliers approved for the Major capability area.
8) Switchboard design is limited to SA Water typical switchboard designs and may also be delivered by the Automation Panel
9) For example, PAC unloading equipment and gantry cranes.
10) Suppliers approved for the Systems Planning capability area may also be engaged to provide hydraulic modelling services for individual projects, in addition to their broader corporate modelling activities.
11) Use of the Environment capability area by third parties to deliver development applications on behalf of SA Water is not permitted without an approved TDRF.
12) Cultural Heritage engagements are managed directly by SA Water's Environment team.
13) Contamination assessments of bore logs associated with geotechnical investigations for specific infrastructure projects may be undertaken within Major and Minor capability areas. This is limited to the identification of contaminated materials encountered in boreholes and does not extend to broader site contamination assessments.

3.1.2 Automation panel

To support consistency and functionality across SA Water's electrical and control infrastructure, SA Water has established an Automation Panel. The scope of works for these Suppliers is to provide systems integration capability and the design of electrical infrastructure (as defined in SA Water Technical Standard TS 0109) and the relevant capability nominated in Table 4 of this Technical Standard.

This includes (but is not limited to) SCADA, telemetry, and other control systems critical to SA Water's operational technology environment.

The companies that constitute SA Water's automation panel are as follows:

e. Alliance Automation

f. ATSYS

g. GPA Engineering

h. Verbrec

i. SAGE Automation

3.1.3 Sub-consulting requirements

Suppliers may enter into sub-consulting arrangements with other Suppliers to support delivery across capability areas, provided those engagements are consistent with the capability areas defined in this Technical Standard.

Panel membership alone does not permit delivery of services outside a supplier's capability area, and any sub-consulting arrangements (including specialist Suppliers sub-consulting to a lead Consultant) shall only be for services within their nominated capability area.

Where multiple Consultants or sub-consultants are engaged on a single project, the Agent's responsibilities shall be as described in Section 4.3.1.

Sub-consulting arrangements may proceed without SA Water approval only where:

- The sub-consultant is a current Supplier on SA Water's Engineering or Automation Panels and is being engaged **within their nominated capability area**; or
- The sub-consultant is not a Supplier on SA Water's Engineering or Automation Panels but is being engaged to provide additional capacity in a capability area already held by the Agent.

Where these conditions are not met (including where it is proposed for a Supplier to deliver services outside their nominated capability area) SA Water approval via a TDRF is required. The TDRF shall detail:

- The rationale for engaging the sub-consultant;
- How the sub-consultant's capability has been assessed in accordance with this Technical Standard;
- How the applicable quality management, review and verification requirements will be met;
- Any corrective actions to be implemented if issues arise.

Use of a sub-consultant does not alter the Consultant's accountabilities under this Technical Standard.

3.1.4 Use of SA Water panels

Except where otherwise permitted by this Technical Standard, Technical Work undertaken for SA Water shall be performed by a Supplier on the applicable SA Water Engineering or Automation Panel. Use of a Consultant outside these Panels requires an approved TDRF before any engagement is entered into.

Approval of any such TDRF does not override any of SA Water's commercial requirements with respect to the engagement of technical services, which shall be followed by the Agent as applicable.

TDRF submissions requesting the use of non-panel Consultants shall include:

a. The reason capability outside SA Water's panels is required;[1]

b. Details of the proposed Consultant's Quality Management System, including applicable certification;

c. The systems and procedures that will be applied to satisfy the review and verification requirements of Section 4.4.2;[2]

d. Evidence that the proposed Consultant and personnel have capability, competence and experience appropriate to the Technical Work;

e. Curricula Vitae for key personnel, demonstrating relevant capability and experience and identifying their roles in the Technical Work, including Designer, Author, Reviewer or Verifier, as applicable;

f. Where multiple non-panel Consultants are proposed, details of how the Agent will satisfy the coordination requirements of Section 4.3.1;

g. Risks associated with engaging a non-panel Consultant and the proposed mitigation measures;[3]

h. How non-conformances will be managed in accordance with Section 7.

    i. Where SA Water is the Agent engaging a non-panel Consultant, the process and documentation in Section 7.2 may be used to manage non-conformances. SA Water's Supply Chain team supports resolution under the applicable purchasing terms and conditions.

[1] Unsubstantiated cost or schedule claims in utilising capability outside of SA Water panels will result in immediate rejection of TDRF submissions

[2] Citing of quality management system certification is insufficient to address this requirement, given this information is a function of a quality system's practical application

[3] Management of these risks shall be nominated in a corresponding mitigation plan

4 General requirements for Technical Work

This section establishes SA Water's general requirements for the management and assurance of Technical Work. Unless expressly stated otherwise, these requirements apply to both Design Workstreams and Technical Consulting Workstreams undertaken for SA Water infrastructure.

This section defines the:

- General quality management and assurance requirements applicable to Technical Work;
- Roles, responsibilities and accountabilities of parties involved in Technical Work;
- Requirements for internal review, verification and authorisation; and
- Requirements for document management and control.

Consultants may determine how the objectives of this section are achieved within their Quality Management System. However, as these requirements are fundamental to ISO 9001 and the assurance framework established by this Technical Standard, dispensations from this section in its entirety will not be considered.

4.1 Design development principles

The requirements of this section apply to the development and delivery of designs for SA Water infrastructure. The Design Consultant shall ensure that appropriate design development, quality assurance and technical review activities are undertaken so[4]:

- Each design stage builds logically on the preceding stage;
- Design deliverables demonstrate increasing technical robustness, maturity and quality;
- Hazards are addressed so far as is reasonably practicable; and
- Design deliverables are free from material errors, omissions and non-conformances.

In addition, designs shall also:

a. Comply with SA Water's Project Requirements and applicable Technical Governance;

b. Consider temporary and enabling works required to support installation, construction, commissioning and maintenance;

c. Incorporate appropriate construction expertise where required by the nature, complexity and technical risk. Where such expertise is required to support design development, the Design Consultant shall ensure that it is obtained, including where a Constructor has not yet been appointed. This does not alter stakeholder participation requirements of TS 0101;

d. Demonstrate appropriate consideration of whole-of-life cost effectiveness, including capital expenditure, operating expenditure and major maintenance[5];

e. Maintain appropriate version control and document identification;

f. Apply technically justified design conservatism, while avoiding unnecessary material and resource use;

g. Use equipment, materials, coatings and detailing appropriate to the operating environment;

h. Consider equipment and material availability, including opportunities to avoid unnecessary spare-parts requirements for SA Water;

i. Deliver outcomes that support safety, sustainability, performance, resilience and public health.

[4] SA Water may return design deliverables that do not satisfy these requirements.

[5] This shall be qualitative, unless detailed analysis is specifically required by SA Water's Project Requirements

4.2 Environmental and sustainability considerations

The requirements of this section apply to Design Workstreams.

In addition to complying with applicable legislative and regulatory requirements, the Design Consultant shall ensure that the following matters are considered, where relevant, during design development:

a. The effects of climate change and flooding, in accordance with TS 0109;

b. Noise and vibration impact during construction and operation;

c. Impacts on native vegetation;

d. The preservation of cultural heritage and areas of cultural significance;

e. Applicable requirements of the South Australian Planning and Design Code;

f. The sustainable design principles established in TS 0107;

g. Opportunities to reduce waste through the reuse or incorporation of existing infrastructure, where technically and economically appropriate;

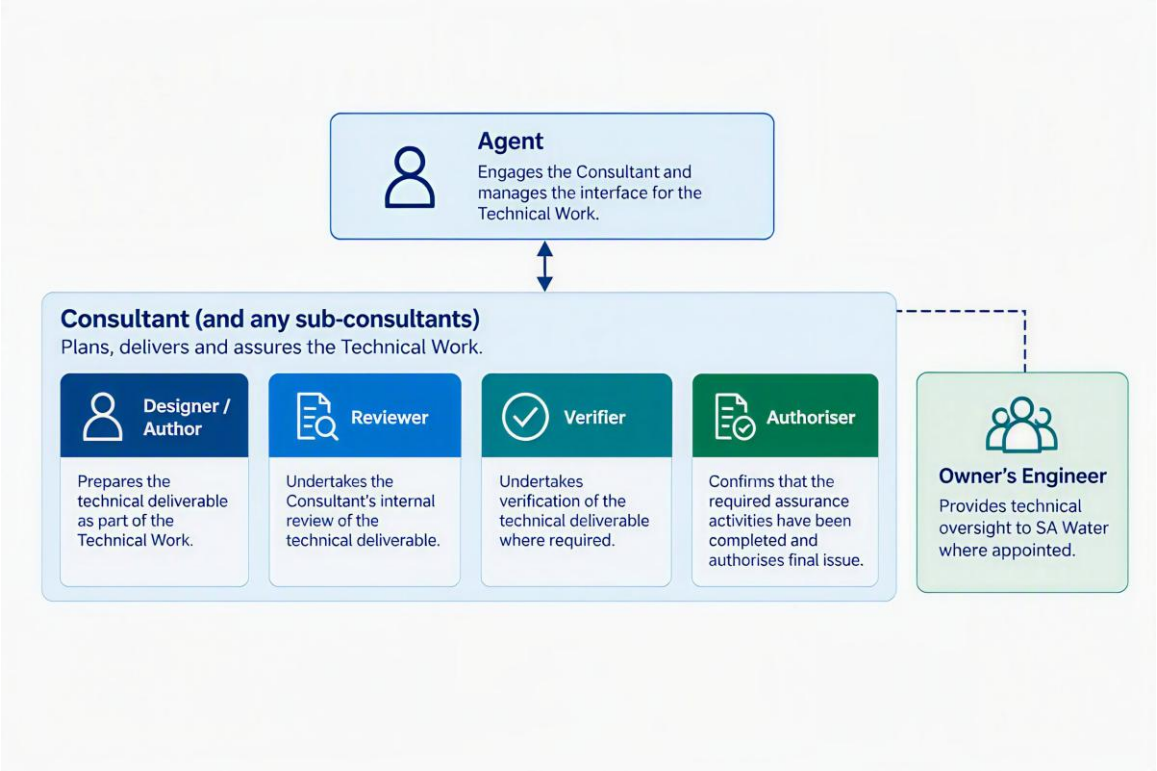
h. Opportunities to reduce construction impacts through appropriate design solutions and construction methods, including less invasive techniques where technically appropriate; and

i. Water-sensitive urban design principles for managing site stormwater runoff.

4.3 Roles, responsibilities and accountabilities

The key roles and relationships involved in the delivery and assurance of Technical Work are summarised in Figure 1. The responsibilities of each role are detailed in the following sections.

Figure 1: Roles and relationships in the delivery of Technical Work



4.3.1 Agent

The Agent is the organisation or individual that engages a Consultant to undertake a Design Workstream or Technical Consulting Workstream in accordance with the Project Requirements. The Agent shall work collaboratively with the Consultant to establish an appropriate engagement scope. Where the Agent determines the technical deliverables to be produced, including their omission, the Agent assumes responsibility for those decisions and any resulting impacts on the adequacy of the work.

Where the Agent engages multiple Consultants, the Agent is accountable for coordinating the engagement scope, interfaces and deliverables and shall ensure that each Consultant operates within its nominated capability area.

Failure by the Agent to satisfy these requirements constitutes a non-conformance under this Technical Standard.

4.3.2 Design Consultant

The Design Consultant is a Consultant responsible for undertaking Design Workstreams and for design management and assurance associated with such engagements. The Design Consultant may be a third party engaged by SA Water or a Constructor, or an internal SA Water entity.

The Design Consultant is accountable for the design and design management activities necessary to satisfy SA Water's Project Requirements. Where the Design Consultant engages sub-consultants or sub-contractors to undertake design or investigation activities, the Design Consultant remains accountable for:

a. Managing design interfaces across the Design Consultants and other Consultants engaged;

b. Coordinating sub-consultant outputs to ensure they are compatible and appropriately integrated; and

c. Confirming that the final design satisfies SA Water's Project Requirements and the design quality requirements of this Technical Standard.

Activities associated with SA Water's acceptance of infrastructure at project completion remain the responsibility of the Representative. However, this shall be supported by the activities of the Design Consultant, as described in this Technical Standard.

4.3.3 Designer / Author

4.3.3.1 General

The individual responsible for developing a technical deliverable shall be identified according to the applicable workstream, as follows:

a. Designer: for a Design Workstream, the individual working for or on behalf of the Design Consultant and responsible for designing infrastructure for SA Water. A Designer undertakes design activities to create design deliverables, as defined in the Work Health and Safety Act 2012 (SA); and

b. Author: for a Technical Consulting Workstream, the individual working for or on behalf of the Consultant and responsible for developing the technical deliverable.

Designers and Authors shall be appropriately qualified, experienced and competent in the subject area of the work they undertake.

SA Water supports and encourages the development of junior and inexperienced personnel. Where such personnel are used for SA Water projects, they shall be supervised and supported by a senior technical professional who is appropriately qualified, competent and experienced in the subject area of the work. The applicable supervision arrangements shall be identified in the approved DMP or accepted CMP, as applicable, and evidenced in the review and verification records for the deliverable.

4.3.3.2 Construction phase support (Design Workstreams)

The Agent[6] shall ensure appropriate Design Consultant technical support is provided during construction and commissioning to maintain design intent and support validation of the completed works. The nature and extent of this support shall be agreed between the Agent and Design Consultant, having regard to the requirements of this section.

Where the Agent elects not to engage the Design Consultant for required technical support, the Agent assumes responsibility for those activities. The Owner's Engineer or other SA Water personnel **shall not** be used as a substitute for omitted Design Consultant support.

4.3.3.2.1 During construction

To ensure the construction of infrastructure designed for SA Water satisfies the original design intent, the Design Consultant is expected to have an active role supporting the Constructor during the construction phase of a project.

This may include one or more of the following (noting this list is not exhaustive), as agreed between the Design Consultant and the Agent:

a. Supporting quality assurance activities by undertaking inspections and validating constructed works against the design to facilitate confirmation of as constructed drawings etc.

b. Reviewing vendor drawings/datasheets etc. to verify compliance with SA Water's Project Requirements, SA Water Technical Governance and the design intent.

c. Checking shop drawings created for fabrication activities, to ensure these are consistent with the design, and comply with SA Water technical standards.

d. Supporting the Constructor through the provision of technical advice and direction, to ensure works are constructed in accordance with the design, and relevant standards.

e. Reviewing, documenting and authorising any design changes made during construction, while ensuring SA Water requirements are satisfied.

4.3.3.2.2 During commissioning

To ensure new SA Water infrastructure is commissioned appropriately and shown to satisfy the original design intent, the Design Consultant shall have an active role during commissioning, including but not limited to:

a. Ensuring the design makes suitable provision for commissioning to be conducted

b. Contributing to preparation of the commissioning plan though:

   i. Inputs to the test procedure

   ii. Confirming required tests and defining pass/fail criteria.

   iii. Defining interfaces to be managed and/or checked.

c. Reviewing and approving the final commissioning plan

The Design Consultant's presence on site during commissioning to troubleshoot/support commissioning activities is also strongly recommended.

[6] For construct-only delivery models, SA Water is responsible for ensuring construction phase technical support is available for matters relating to the design and maintenance of the design intent only.

4.3.4 Reviewer

The Reviewer is an appropriately qualified and experienced individual working for or on behalf of the Consultant who is responsible for undertaking the Consultant's internal review of technical deliverables prepared as part of the Technical Work.

All technical deliverables prepared for SA Water shall be subject to internal review by a Reviewer in accordance with Section 4.4.2.2.

The Reviewer shall:

- Have qualifications appropriate to the subject area being reviewed;
- Have relevant industry experience appropriate to the nature, complexity and technical risk of the work;
- Not be responsible for preparing the deliverable being reviewed; and
- For Design Workstreams, have at least seven years of relevant industry experience and satisfy the registration requirements of Section 4.4.2.1.

4.3.5 Verifier

The Verifier is an appropriately qualified and experienced individual working for or on behalf of the Consultant who is responsible for verifying technical deliverables prepared as part of the Technical Work. Verification is required where specified by this Technical Standard, the approved DMP or the accepted CMP.

The Verifier shall:

a. Have qualifications appropriate to the subject area for which the verification is being undertaken

b. Have at least ten years of relevant industry experience specifically related to the subject area for which the verification is being undertaken and

c. Satisfy the registration requirements of Section 4.4.2.1.

4.3.5.1 Verifier independence

SA Water does not require Verifiers to be independent of the Consultant, nor completely independent of the Designer or Author. The Designer or Author may engage with Verifiers at a high level throughout development of a deliverable for support or guidance, to ensure the deliverable satisfies SA Water's Project Requirements and this Technical Standard.

This engagement with the Verifier is subject to the following conditions:

a. The Verifier shall not be directly involved in creating the deliverable being verified, including modelling, calculations, reports or drawings.

b. The Verifier is not to act as Reviewer on the same design deliverable for infrastructure with an ACR ≥ 3.

Third-party independent verification of designs in accordance with AS/NZS ISO 9001 shall be undertaken only where specified in SA Water's Project Requirements.

4.3.6 Authoriser

The Authoriser works for or on behalf of the Consultant and is responsible for confirming that the applicable quality assurance, review and verification activities for a deliverable have been completed in accordance with this Technical Standard before final issue. In authorising a final deliverable, the Authoriser confirms that:

a. Quality assurance, checks, reviews and verification activities have been completed;

b. Deliverables prepared by sub-consultants have been appropriately coordinated and integrated;

c. Applicable statutory, safety and technical requirements have been addressed; and

d. The deliverable is complete and suitable for its intended use.

SA Water permits the Reviewer or Verifier to perform the role of the Authoriser, subject to their satisfying all requirements of this Technical Standard.

4.3.7 Owner's Engineer

The Owner's Engineer is a role undertaken by SA Water Engineering, or a Consultant engaged by SA Water Engineering to act on its behalf, to protect SA Water's interests by technical oversight of works against SA Water's Project Requirements. The Owner's Engineer may monitor or review design, construction and commissioning activities and raise matters for the Consultant or Constructor to address.[7]

The presence of an Owner's Engineer on a project is determined by SA Water and will be communicated to the Agent and Consultant by the SA Water Representative.

Where an Owner's Engineer is appointed, the Consultant shall provide deliverables for review at the stages identified in the approved DMP or accepted CMP, as applicable, and SA Water's Project Requirements.

The Owner's Engineer:

a. Is **not** responsible for undertaking the Consultant's quality management, review, verification, validation or document management activities

b. Shall not be considered part of the Consultant's or Constructor's quality management processes.

c. Shall be considered as part of the engagement process required during design development, which shall be guided by the Project Requirements

d. **Does not** relieve the Consultant or Constructor of their responsibilities for the suitability, completeness or performance of their deliverables or constructed works.

e. **Does not** assume responsibility for errors, deficiencies, defects or omissions in a Consultant's or Constructor's deliverables as a result of undertaking a review; and

f. Is **not** required to accommodate accelerated review periods arising from matters within the Consultant's or Constructor's control. Any accelerated review period shall be subject to agreement by the Owner's Engineer

For Design Workstreams, the Agent and Consultant shall ensure engagement with the Owner's Engineer before the 30% design review gate. Failure to do so, unless otherwise approved through a Technical Dispensation Request, constitutes a non-conformance with this Technical Standard.

[7] In land development projects, this role is undertaken by the Approved Superintendent.

4.4 Quality management

4.4.1 General

Quality management is essential to achieving safe, functional and technically sound outcomes for SA Water infrastructure. Consultants undertaking work under this Technical Standard shall maintain and apply quality management arrangements proportionate to the nature, complexity and technical risk of the work. As a minimum, Consultants shall:

a. Maintain a Quality Management System (QMS) meeting the applicable requirements of this section as follows:
    - for SA Water projects, the QMS shall maintain third-party certification to AS/NZS ISO 9001;
    - for land development projects, the Consultant shall either:
        - maintain third-party certification to AS/NZS ISO 9001, which is the preferred approach; or
        - where the Consultant is an existing Approved Consultant, demonstrate conformity with AS/NZS ISO 9001 through a second-party audit undertaken in accordance with AS/NZS ISO 19011. This grandfathered pathway is not available to new applicants.

b. Assign personnel with capability, competence and experience proportionate to the technical risk and complexity of the work, informed by the organisation's technical risk classification system and associated review and verification requirements;

c. Maintain review and verification procedures that achieve the outcomes of this Technical Standard;

d. Maintain systems for personnel competency, training, development and succession;

e. Have a procedure to ensure comments, actions and technical issues arising from reviews, design verification and safety in design activities are appropriately addressed and closed; and

f. Maintain appropriate and traceable document version control.

SA Water reserves the right to audit and request evidence of the application of a Consultant's quality systems at any time, to ensure that all requirements of this Technical Standard are being satisfied.

4.4.2 Review and verification

4.4.2.1 General

A review and verification process provides safeguards against technical errors, omissions and inconsistencies that may prevent required technical, safety, performance or project outcomes from being achieved.

Consultants shall undertake review and verification activities proportionate to the nature, complexity and technical risk of the work. Review and verification shall be undertaken in accordance with the Consultant's QMS and the requirements of this Technical Standard.

Documented evidence shall accompany deliverables issued by the Consultant, confirming that the required review and verification activities have been undertaken in accordance with the approved DMP or accepted CMP, as applicable, and identifying the personnel who undertook those activities.

Provision of this evidence constitutes a **WITNESS POINT** under this Technical Standard. The evidence shall be provided:

a. For land development projects, whenever a design is submitted for audit; and

b. For SA Water projects, at each applicable Design Review Gate for Design Workstreams or review point for Technical Consulting Workstreams, with verification evidence provided at the verification points identified in the approved DMP or accepted CMP, as applicable.

Reviewers and Verifiers shall:

- Undertake review or verification activities only within their areas of competence and in accordance with their professional engineering body's code of ethics; and
- Where the review or verification relates to an engineering discipline, be a Chartered Professional Engineer (CPEng) or equivalent (for example, RPEng) and be registered with a recognised professional engineering body[8] as nominated in Table 5. For other professional disciplines, hold an appropriate professional registration, accreditation or equivalent recognised credential relevant to the work being reviewed or verified.

Table 5: Professional registration requirements

Role	Professional Registration
Authoriser	Not required
Verifier	Required
Reviewer	Required
Designer/Author	Not required

4.4.2.2 Internal review

Internal review is a quality assurance process undertaken within the Consultant to confirm the suitability, completeness and technical adequacy of a deliverable before any required verification or issue to SA Water.

An internal review shall be undertaken for all technical deliverables prepared for SA Water. The review shall be proportionate to the nature, complexity and technical risk of the work and shall confirm, as a minimum, that the deliverable:

a. Satisfies the objectives of SA Water's Project Requirements and is suitable for its intended purpose;

b. Is technically sound and adequately considers constructability, commissioning and operability where these are relevant to its intended application;

c. Has been appropriately coordinated across relevant engineering disciplines, interfaces, design packages and other project activities;

d. Uses appropriate and current analysis/design methods, references, systems and equipment;

e. Is based on appropriate inputs, and that those inputs have been correctly selected, applied and, where appropriate, validated;

[8] For Land Development, an existing Approved Consultant may submit a TDRF seeking dispensation from the professional registration requirement for an individual nominated to perform the Reviewer role where that individual has at least 20 years of relevant industry experience. Any dispensation granted under this provision applies only to the nominated individual for the Reviewer role, and is not transferable. This grandfathered provision is not available to new applicants for Approved Consultant status and shall not be used to establish equivalence with CPEng or other professional registration.

f. Contains no significant computational, drafting or documentation errors, omissions, conflicts or inconsistencies;

g. Satisfies applicable SA Water Technical Governance requirements, Australian and International Standards, legal and statutory requirements and any approved Technical Dispensation Requests;

h. Is consistent with recognised industry practice;

i. Clearly conveys its technical basis, conclusions and intended application and contains sufficient information to be understood and used for its intended purpose; and

j. Complies with SA Water's applicable documentation and formatting requirements.

For calculations and modelling, the review is not expected to reproduce every calculation. The Reviewer shall undertake alternative calculations or detailed checks of a representative sample sufficient to provide confidence that significant errors are not present. Modelling parameters, assumptions and boundary conditions shall be checked to confirm that they are realistic, technically justified and appropriately conservative having regard to the purpose, uncertainty and risk associated with the work.

The Reviewer shall document the review and identify matters requiring resolution. The person responsible for preparing the deliverable shall respond to matters raised by the Reviewer and liaise with the Reviewer until the Reviewer is satisfied that the matters have been appropriately addressed and the actions documented. Internal reviews may be undertaken progressively. Evidence that the required internal review has been completed shall accompany the deliverable when issued to SA Water.

4.4.2.3 Verification

Verification is a risk-mitigation process undertaken by the Verifier to confirm that the deliverable satisfies SA Water's Project Requirements, is technically adequate for its intended purpose and that identified technical risks have been appropriately addressed.

Verification shall be proportionate to the nature, complexity and technical risk of the work and shall confirm, as a minimum, that:

a. The required internal review has been completed and matters raised by the Reviewer have been appropriately addressed;

b. The criteria and inputs underpinning the deliverable are appropriate, complete and correctly applied;

c. The methods, calculations, analyses and modelling used are appropriate and support the deliverable's outputs;

d. The deliverable is technically sound and adequately addresses safety, constructability, commissioning, operability and maintainability where relevant to its intended application;

e. Interfaces between disciplines, workstreams, packages, existing infrastructure and other project activities have been appropriately coordinated;

f. The deliverable satisfies applicable SA Water Technical Governance requirements, Australian and International Standards, legal and statutory requirements and any approved Technical Dispensation Requests; and

g. The deliverable is sufficiently complete and coordinated to convey its technical basis and support its intended use.

The Verifier shall document the verification and identify matters requiring resolution. The Designer or Author, as applicable, shall respond to matters raised by the Verifier and liaise with the Verifier until the Verifier is satisfied that the matters have been appropriately addressed and the actions documented.

For a design of low technical complexity, approval may be sought through a Technical Dispensation Request to reduce or omit the design verification requirements that would otherwise apply. Such requests shall demonstrate how adequate design assurance and confidence will be achieved without requiring additional oversight from SA Water.

4.4.3 Deliverable authorisation

Authorisation establishes accountability for the issue of deliverables to SA Water. The Authoriser shall confirm that the review and any required verification activities have been completed in accordance with the approved DMP or accepted CMP, as applicable, and that matters identified through those activities have been appropriately addressed before authorising the deliverable for issue.

Deliverables issued to SA Water shall identify the Authoriser responsible for authorising their issue.

4.4.4 Design validation

The purpose of design validation is to confirm that SA Water's Project Requirements will be satisfied by the design. This process differs from verification in that it occurs over multiple phases of an infrastructure project, starting with design and ending with completion of commissioning. The ultimate aim is to:

a. Ensure that what is being built during the construction phase matches the design intent through the provision of construction phase support

b. Validate, through commissioning and review of as constructed drawings, that the completed infrastructure:

   i. Has been constructed in accordance with the design.

   ii. Functions in accordance with the design intent and satisfies SA Water's Project Requirements.

Validation under item b) shall be supported by appropriate evidence from commissioning and as-constructed information.

Where infrastructure is brought into service via a commissioning plan, the Designer shall provide written confirmation that the commissioning results demonstrate operation of the infrastructure as designed. The Designer's presence on site shall comply with the requirements of 4.3.3.2.2.

- As-constructed information used for design validation shall be reviewed in accordance with Section 4.5.4.

The Agent may assume the responsibilities of item a) above, subject to the requirements of Section 4.3.3.2. Responsibility for validation under item b) remains with the Design Consultant.

4.5 Document management

SA Water requires all technical deliverables prepared for its infrastructure to incorporate document control principles throughout their development, issue and subsequent revision. This section establishes the minimum document control requirements applicable to deliverables produced under Design and Technical Consulting Workstreams.

Professional qualification and registration requirements for Reviewers and Verifiers are provided in Section 4.4.2.1.

4.5.1 Document revision

Revisions of technical deliverables, excluding design drawings, shall follow this convention:

a. Minor revisions shall be used during review and verification activities and shall increase in 0.1 increments

b. Major revisions shall be used when deliverables are formally issued and shall increase in 1.0 increments.

For example, a report initially issued internally at revision 0.1 and subsequently revised twice during review and verification would become revision 0.3.

4.5.2 Technical documents

Technical documents shall include document control information in accordance with Table 6. For large or multi-discipline engagements, multiple Designers or Authors may contribute to a document to reflect the engineering discipline involved. However, only one individual shall act as the Authoriser.

Table 6: Document control requirements

Revision	Date	Designer/Author	Reviewer	Verifier	Status
0.1	*dd/mm/yy*	*Given Name, Surname* *Title* *Organisation*	*Given Name, Surname, Post nominals* *Title* *Registration no.*(1) *Organisation*	*Given Name, Surname, Post nominals* *Title* *Registration no.*(1) *Organisation*	*Draft*
0.2	*dd/mm/yy*	*Given Name, Surname* *Title* *Organisation*	*Given Name, Surname, Post nominals* *Title* *Registration no.*(1) *Organisation*	*Given Name, Surname, Post nominals* *Title* *Registration no.*(1) *Organisation*	*Issued for review*
Authorised by:					

Notes:

1) Professional engineering registration number or equivalent.

4.5.3 Design drawings

Design drawings shall comply with TS 0100, including revision and version control requirements throughout design development. Final design deliverables shall be managed within SA Water's approved drawing management system (Meridian/Lunr).

For the design panel, author names shall be recorded using the format 'first name initial', 'full surname' (e.g. J. DRAFTER).

4.5.4 As constructed drawings

As-constructed drawings provide an essential record of the infrastructure constructed and support design validation in accordance with Section 4.4.4. They also provide SA Water with information necessary to identify the location, configuration and orientation of constructed infrastructure for future reference.

Preparation of as constructed drawings by the Designer is not a mandatory requirement. However, as constructed drawings shall be:

a. Developed in accordance with the quality requirements of this Technical Standard

b. Developed and submitted in accordance with TS 0100, TS 0130 and TS 0134

c. Reviewed by the Designer with written confirmation that the as-constructed information represents infrastructure constructed in accordance with the approved design position and SA Water Project Requirements.

The Designer's review shall include appropriate cross-checking against related design documentation to confirm the completeness and consistency of the as-constructed information, including where drawings are returned with no recorded changes.

The Designer is not responsible for the accuracy of the as-constructed drawings unless engaged to prepare or verify that information. Any lack of detail that prevents the Designer from providing the required confirmation shall be raised with the Constructor for resolution.

Where the Designer identifies a departure from the approved design position or SA Water Project Requirements, whether arising from a construction defect or an unauthorised change, the Constructor shall raise a non-conformance in accordance with TS 0105.

4.5.5 Digital signatures

Digital signatures shall be used for all deliverables where signatures are required. As a minimum, the details within the digital signature shall be presented in the following order:

a. Full Name

b. Signature

c. Title

d. Organisation[9]

e. Date

An important distinction between digital signatures and electronic signatures is that the latter are not validated for authenticity. An electronic signature is simply an electronic representation of a person's signature, whereas a digital signature contains a unique digital identifier to verify its authenticity.

[9] Typically, the Designer's direct employer, unless otherwise agreed in a secondment arrangement.

5 Design requirements – land development

This section outlines SA Water's specific requirements for designs prepared for land development projects, which are delivered via a DAFI.

5.1 Review and issue of designs

For land development infrastructure delivered via a DAFI, in addition to the requirements of TS 0101 and TS 0523, interface and engagement with key project stakeholders shall be undertaken in accordance with SA Water's "*Major Land Developments Safety in Design Management Plan*", which is available on the SA Water website.

5.2 Use of consultants

Land developers shall only engage:

a. SA Water Approved Consultants to prepare designs for new water/sewer infrastructure (in accordance with Table 7) and

b. SA Water Approved Superintendents to oversee construction activities.

The requirements and application process for these consultants is presented in Sections 5.3 and 5.4 respectively, along with the criteria against which their performance is evaluated and managed.

Land developers engaging these companies are advised that SA Water makes no guarantees or warranties regarding the performance, commercial practices or financial status of these companies, and expects appropriate due diligence be undertaken prior to engaging their services.

5.2.1 Sub-consulting requirements

An Approved Consultant may only engage sub-consultants for land development projects where these are:

a. Another Approved Consultant, with a performance rating level of 1 or 2 at the time of engagement or

b. A member of SA Water's panels (refer section 3.1)

Use of a sub-consultant does not alter the Design Consultant's accountabilities under Section 4.3.2.

5.3 Approved Consultants for land development

Approved Consultants for land development are consultants who are approved to undertake design of SA Water infrastructure for works delivered under a DAFI. SA Water maintains an Approved Consultants rating list, which can be found on the SA Water website.

For continued inclusion on the list of Approved Consultants, an Approved Consultant shall:

a. Consistently perform at a rating level of 1 or 2

b. Be actively participating in design for water and sewer infrastructure, over a 24-month period

c. Satisfy Quality Management System certification and insurance requirements **and**

d. Maintain an office presence within South Australia

SA Water Approved Consultants are only authorised to prepare and submit designs as permitted in Table 2. The design of this infrastructure shall comply with the requirements of SA Water's Technical Governance, relevant national standards and WSAA codes (including SA Water supplements to these).

5.3.1 Application process

Applicants seeking to become an Approved Consultant shall be familiar with SA Water's technical requirements **prior** to making an application and shall:

a. Provide details and evidence of appropriate qualifications and experience for all key personnel undertaking functions nominated in Section 4.3.

b. Provide a copy of the company's Quality Management System certification

c. Provide Public Liability and Professional Indemnity insurance certificates of currency

d. Demonstrate experience in design projects of various levels of complexity

e. Provide copies of designs **and** safety in design hazard registers for three projects of similar complexity to the design of SA Water infrastructure

f. Not have been removed from SA Water's Approved Consultant's rating list within the last 18 months.

g. Provide references from other infrastructure owners (e.g. Councils, Water Authorities etc.) for whom the applicant has delivered work

Applications shall include all information and evidence required by this Technical Standard as incomplete applications will not be assessed. SA Water may make one request for missing information before rejecting the application.

For complete applications, SA Water may interview the applicant or request further information to assess capability. Requested information shall be provided within 10 business days. If it is not provided within this timeframe, the application will be considered withdrawn and rejected.

5.3.2 Application outcomes

SA Water will provide a written application outcome using the evaluation criteria in Table 7. Where applications are successful:

- SA Water will update the Approved Consultant Rating List to include the successful company[10].
- A newly listed Approved Consultant will initially be rated at level 2.

Where information submitted in the application does not satisfy SA Water's requirements, applications will be rejected, and applicants will be ineligible to make another application for a period of not less than 12 months. This decision is final and is not subject to appeal.

Table 7: Approved Consultant Evaluation Criteria

Criteria	Requirement
Personnel	Suitably qualified and experienced key personnel, per Section 4.3.
Quality Systems	Satisfies the requirements of Section 4.4.1
Insurance	Sums insured consistent with the requirements of Annexure A of the DAFI
Experience	Evidence of extensive involvement in ≥ 3 relevant design projects
Quality	**No** major and **two or less** minor non-conformances in documents submitted
Client References	Positive references about the applicant and work completed

[10] In approving applications, SA Water reserves the right to impose conditions as necessary to ensure the performance requirements of this Technical Standard are satisfactorily achieved

5.4 Approved Superintendents for land development

Approved Superintendents for land development are consultants who support works in accordance with Annexure D of SA Water's DAFI and this Technical Standard.

For continued inclusion on the list of Approved Superintendents, an Approved Superintendent shall:

a. Consistently perform at a rating level of 1 or 2

b. Be actively participating in superintendency for water and sewer infrastructure, over a 24-month period

c. Hold insurance as required by this Technical Standard **and**

d. Maintain an office presence within South Australia

5.4.1 Role of the Approved Superintendent

The role of the Approved Superintendent is to:

a. assess and approve the construction programme proposed by the Constructor(s)

b. assess the Constructor's quality assurance processes and quality assurance documentation records, to ensure compliance with project and SA Water requirements.

c. report monthly to the Principal and SA Water, on quality assurance activities performed and Constructor compliance with SA Water's requirements

d. conduct surveillance activities in the field (in addition to site meetings) to verify compliance against SA Water's requirements

e. ensure proposed and actual construction practices/procedures satisfy SA Water requirements

f. assess the quality of materials and workmanship per the contract documents and SA Water requirements

g. provide technical direction to the Constructor as required

h. assess progress claims, issue progress certificates and direct variations to the work under the contract

i. assess claims for extra payments for variations to the contract, claims relating to latent conditions or claims for extensions of time

j. foster appropriate interface between the Designer and Constructor to ensure accountabilities and responsibilities in designing/constructing infrastructure are upheld

k. support the successful delivery of infrastructure to SA Water by **proactively**:

    i. managing risk

    ii. addressing issues (whether quality, safety or otherwise) before and as they arise

    iii. supporting an effective quality assurance process (inclusive of raising/closing non-conformances identified during construction)

    iv. reviewing the practices used by Constructors to identify and address any shortcomings before infrastructure is built and

    v. supporting any defect rectification works that may be required.

Only SA Water Approved Superintendents may undertake this role and shall be listed as an Approved Superintendent on the date on which the Developer signs the DAFI.

5.4.2 Application process

Applicants seeking to become an Approved Superintendent shall be familiar with SA Water's technical requirements **prior** to making an application and shall:

a. Provide details and evidence of appropriate qualifications (for example, degrees/certificates in civil engineering and/or construction etc.) and experience for all key personnel.

b. Provide details of Public Liability and Professional Indemnity insurances held

c. Demonstrate experience in water/sewer infrastructure projects of various levels of complexity

d. Provide client references for previous Superintendent engagements

e. Not have been removed from SA Water's Approved Superintendent's rating list within the last 18 months.

Applications shall include all information and evidence required by this Technical Standard as incomplete applications will not be assessed. SA Water may make one request for missing information before rejecting the application.

For complete applications, SA Water may interview the applicant or request further information to assess capability. Requested information shall be provided within 10 business days. If it is not provided within this timeframe, the application will be considered withdrawn and rejected.

5.4.3 Application outcomes

SA Water will provide a written application outcome using the evaluation criteria in Table 8. Where applications are successful:

a. SA Water will update the Approved Superintendent rating list to include the successful company.[11]

b. A newly listed Approved Superintendent will initially be rated at level 2.

Where information submitted in the application does not satisfy SA Water's requirements, applications will be rejected, and applicants will be ineligible to make another application for a period of not less than 12 months. This decision is final and is not subject to appeal.

Table 8: Approved Superintendent Evaluation Criteria

Criteria	Requirement
Personnel	Suitably qualified and experienced key personnel
Insurance	Sums insured consistent with the requirements of Annexure A of SA Water's land development agreement
Experience	Proof of extensive involvement in at least 3 relevant infrastructure projects
Client References	Positive notes about the applicant/applicant's agency and the work carried out

[11] In approving applications, SA Water reserves the right to impose conditions as necessary to ensure the performance requirements of this Technical Standard are satisfactorily achieved

5.5 Performance management

SA Water manages the performance of Approved Consultants and Approved Superintendents for land development via classification ratings, which are released quarterly. Details of how this process functions for each are described below and **apply only for these consultants**.

5.5.1 Performance level ratings

SA Water uses a performance level rating structure for its Approved Consultants and Approved Superintendents as shown in Table 9, which is informed by audits against performance criteria. Superscripts may also be provided as shown in Table 10, to indicate levels of consultant activity.

Approved Consultants are also assigned an overall performance score based on their accepted design scores for the performance review period. This score is used to rank Approved Consultants within the same performance level rating[12].

Table 9: Performance level ratings

Rating	Description	Notes
Level 1	Outstanding	Approved Consultant/Superintendent has performed at a high standard against the requirements of this Technical Standard.
Level 2	Acceptable	Approved Consultant/Superintendent has not achieved the standard to be rated Level 1 but has still performed at a level which justifies their continued presence on SA Water's rating list.
Level 3	Unacceptable	Approved Consultant/Superintendent has not fulfilled the requirements of this Technical Standard. The consultant will be permitted to complete development works for which they have already been formally engaged as a final opportunity to demonstrate improved performance, before being removed.

Table 10: Performance level rating superscripts

Superscript	Description	Notes
^	Inactive (last 3 months)	Where an Approved Consultant/Superintendent has not been active in land development infrastructure projects during the previous three-month period, they will be assigned a caret.
*****	Inactive (12 months)	Where an Approved Consultant/Superintendent has not been active in land development infrastructure projects during the previous 12-month period, they will be assigned an asterisk.
#	Inactive (18 months)	Where an Approved Consultant/Superintendent has not been active in land development infrastructure projects during the previous 18-month period, they will be assigned a hash.

[12] The performance level rating takes precedence over the overall performance score.

5.5.2 Performance assessment

SA Water collects performance data on Approved Consultants and Approved Superintendents through audits of designs and site performance respectively. The resulting performance data is used in the quarterly performance review process described in Section 5.5.3.

5.5.2.1 Approved Consultants

Approved Consultants shall submit designs for technical audit by SA Water for performance to be evaluated. Each submission of a design for audit constitutes an audit cycle. The design and supporting information will be assessed for conformity with SA Water's Technical Governance and against the performance criteria in Table 12.

Metrics B, C and D are assessed during each audit cycle until the design is accepted. Metric A is determined once the design is accepted, based on the total number of audit cycles required to achieve acceptance.

For each design achieving audit acceptance (accepted design), the results for Metrics B, C and D shall be calculated as the arithmetic mean of the scores assigned across all audit cycles required to achieve acceptance. Each accepted design shall carry equal weight when calculating the Approved Consultant's performance results for the review period.

The accepted design score shall be calculated as the sum of the Metric A result and the averaged Metric B, C and D results for the completed audited design.

SA Water's audit does not constitute approval, verification, acceptance of, or assumption of responsibility for the design. Responsibility for the accuracy, completeness, and compliance of the design documentation with SA Water's requirements remains with the Approved Consultant. Any design, drafting, coordination, or documentation errors identified following completion of the SA Water audit **remain the responsibility of the Approved Consultant**.

Table 11: Audit outcome and accepted design result - example

Performance[1,3]	First submission	Second submission	Accepted design result
Metric A[2]	-	-	2.40
Metric B	1.25	2.50	$\frac{(1.25 + 2.50)}{2} = 1.88$
Metric C	2.50	2.50	$\frac{(2.50 + 2.50)}{2} = 2.50$
Metric D	1.90	2.00	$\frac{(1.90 + 2.00)}{2} = 1.95$
Accepted design score[4]			**8.725**
Audit outcome	One minor technical non-conformance & minor deficiencies in SiD documentation. Design returned	No technical non-conformances. SiD documentation satisfies requirements. Audit acceptance achieved.	Design audit acceptance after two audit cycles

Notes:

1) Scoring per Table 12.
2) Metric A is determined once the total number of audit cycles required to achieve acceptance.
3) Metrics B, C and D are averaged across all audit cycles required to achieve acceptance.
4) The accepted design score is the sum of the metric A result and the averaged metric B, C and D results.

5.5.2.2 Approved Superintendents

SA Water will conduct audits of project quality documentation at the commencement and conclusion of projects, to evaluate Approved Superintendent performance coupled with other performance metrics as shown in Table 14. The resulting scoring will then be used to inform consultant ratings at the end of the performance review period.

5.5.3 Performance review and rating

SA Water's performance review process for Approved Consultants and Approved Superintendents is undertaken quarterly to identify and reflect changes in performance and activity levels promptly. This frequency also provides opportunities for consultants to improve over the following performance cycle, and for ratings to be updated based on the outcome of those efforts.

The complexity of individual projects is not considered as a separate factor during the performance review process. Consultants shall allocate resources, capability and expertise appropriate to the work being undertaken.

5.5.3.1 Approved Consultants

SA Water will assess Approved Consultant performance for each review period using the metrics and thresholds provided in Table 12 and Table 13.

Table 12: Performance metrics, Approved Consultants

Metric	Description	Weighting	Scoring key	Score
A	Audit cycles required to achieve acceptance	30%	Design accepted on first submission	3.00
			Design returned once	2.40
			Design returned twice	1.80
			More than twice[2]	0
B	Quality of SiD documentation	25%	SiD process applied and documented satisfactorily	2.5
			SiD process applied, with minor deficiencies in documentation	1.25
			SiD process has been superficially applied	0
C	Major non-conformances[1]	25%	No major non-conformances	2.50
			One or more major non-conformances	0
D	Minor non-conformances[1]	20%	No minor non-conformances	2.00
			One minor non-conformance	1.90
			Two minor non-conformances	1.80
			Three minor non-conformances	1.60
			Four minor non-conformances	1.40
			More than four minor non-conformances	0

Notes:

1) Refer Appendix B for details of major and minor non-conformances
2) Where designs have not achieved SA Water acceptance within two audit cycles, designs shall be certified as complying with SA Water requirements by a member of SA Water's Engineering Panel **prior** to resubmission for audit

Performance rating and ranking

The Approved Consultant's result for each performance metric is calculated as the arithmetic mean of that metric's results across all accepted designs in the performance review period. Each accepted design carries equal weight in this calculation.

The result for each performance metric is then compared with the applicable threshold in Table 13. The Approved Consultant's resulting performance level rating will be the lowest level achieved for any performance metric.

The Approved Consultant's overall performance score is calculated as the arithmetic mean of the accepted design scores for the performance review period. Each accepted design shall carry equal weight in this calculation.

Approved Consultants within the same performance level rating are ranked from highest to lowest overall performance score.

Table 13: Rating score thresholds, Approved Consultants

Metric	Description	Required Score		
		Level 1	Level 2	Level 3
A	Audit cycles	A ≥ 2.60	1.80 ≤ A < 2.60	A < 1.80
B	Quality of SiD documentation	B ≥ 2.20	1.25 ≤ B < 2.20	B < 1.25
C	Major non-conformances	C ≥ 2.20	2.00 ≤ C < 2.20	C < 2.00
D	Minor non-conformances	D ≥ 1.90	1.60 ≤ D < 1.90	D < 1.60

5.5.3.2 Approved Superintendents

SA Water will assess Approved Superintendent performance using the metrics and scoring provided in Table 14.

Table 14: Performance metrics (Approved Superintendents)

Metric	Description	Weighting	Scoring key	Score
A	Quality Assurance – Inception(1)	20%	QA documentation reviewed & free of errors/omissions.	2.0
			QA documentation reviewed & up to three errors/omissions still present.	1.0
			QA documentation not reviewed or more than three errors/omissions still present.	0
B	Quality Assurance – Completion(2)	25%	QA documentation collated and supplied to SA Water. Documentation is fully and correctly completed, inclusive of evidence that the Superintendent has released appropriate hold points.	2.5
			QA documentation collated and supplied to SA Water. Documentation contains up to five errors/omission(3)	1.25
			QA documentation is not collated and supplied to SA Water and/or documentation contains more than five errors/omissions(3)	0
C	Undetected non-conformances(4) *(per project)*	25%	All non-conformances raised and actioned by Superintendent	2.5
			One or more non-conformances not detected which are raised by SA Water	0
D	Technical Capability and Efficacy(5,6) *(per project)*	30%	All measures adequately satisfied	3.0
			Up to two instances of measures not being adequately satisfied	1.5
			More than two instances of measures not being adequately satisfied	0

Notes:

1) Superintendent has a key role in ensuring a Constructor's QA documentation (QMP, ITP's etc.) is adequate and correct at project outset. This metric reflects a review being undertaken by the Superintendent, ensuring corrections are made to any errors/omissions found, and final endorsement of the documentation for use in the project.
2) The Superintendent's role during construction is reflected in Section 5.4, and at the conclusion of construction, evidence of the Superintendent's release of appropriate hold points shall be provided in the form of collated and finalised QA documentation.
3) Including any lack of evidence that the Superintendent has released appropriate hold points.
4) A measure of Superintendent efficacy on site during construction as evidenced by the proactive raising and resolution of non-conformances across their entire involvement with the project under the DAFI.
5) Factors contributing to the measurement of Superintendent Technical Capability and Efficacy include:
   a) Timely and appropriate response to RFI's
   b) Aptitude to provide technical input to the constructor to resolve construction defects/issues in accordance with SA Water requirements
   c) Demonstrated ability to proactively identify unsuitable construction techniques and ensure appropriate methods are adopted **before** infrastructure is constructed.
6) Performance criteria measured by substantiated instances of Constructors, SA Water or Developer indicating that their needs against the criteria in Note 5) are not being adequately satisfied.

Performance rating

The Approved Superintendent's results for each performance metric are calculated as the arithmetic mean of that metric's results across projects completed during the performance review period.

The result for each performance metric is compared with the applicable threshold in Table 15. The Approved Superintendent's resulting performance level rating will be the lowest level achieved for any performance metric.

Table 15: Rating Score Thresholds (Approved Superintendents)

Metric	Description	Required Score		
		Level 1	Level 2	Level 3
A	Quality Assurance – Inception	A ≥ 1.7	0.80 ≤ A < 1.7	A < 0.80
B	Quality Assurance – Completion	B ≥ 2.1	0.80 ≤ B < 2.1	B < 0.80
C	Undetected non-conformances	C ≥ 1.6	0.80 ≤ C < 1.6	C < 0.80
D	Technical Capability and Efficacy	D ≥ 2.5	0.75 ≤ D < 2.5	D < 0.75

5.5.4 Assignment of rating levels

Performance level ratings will be assigned based on the outcome of quarterly performance reviews as shown in Table 16:

Table 16: Assignment of rating levels

Initial rating	Performance(1)	Final rating
Level 1	Level 1	Level 1
	Level 2	Level 2
	Level 3	Level 3(2)
	Inactive	Level 2(3)
Level 2	Level 1	Level 1
	Level 2	Level 2
	Level 3	Level 3(2)

Notes:

1) Refers to consultant performance against criteria in Table 12 or Table 14
2) Unacceptable levels of performance will result in a level 3 rating.
3) Where period of inactivity spans two consecutive performance review cycles

5.5.5 Activity requirements

To maintain experience and knowledge of SA Water's requirements, Approved Consultants and Approved Superintendents shall remain active in land development infrastructure projects. Approved Consultants or Approved Superintendents rated as Level 1, shall not be inactive for more than 2 performance review periods.

Before revoking an Approved Consultant or Approved Superintendent's listing due to inactivity, SA Water will engage with the Approved Consultant or Approved Superintendent, to provide an opportunity for activity levels to increase.

5.5.5.1 Approved Consultants

Approved Consultants that submit fewer than three designs, including applicable SiD requirements, during the previous 12-month period will be considered inactive. Where this inactivity continues for 24 months, the Approved Consultant's listing will be revoked.

5.5.5.2 Approved Superintendents

Approved Superintendents that act in that role for fewer than three land development projects during the previous 12-month period will be considered inactive. Where this inactivity continues for 24 months, the Approved Superintendent's listing will be revoked.

5.5.6 Ongoing requirements

In addition to satisfying the performance and activity requirements of this section, Approved Consultants and Approved Superintendents shall provide the following information when requested by SA Water:

- Documentation demonstrating continued Quality Management System certification
  - For consultants using non-certified systems, this becomes second party audit results indicating a compliant system.
- Certificates of Currency for Insurance

Failure to supply this information may serve as grounds for revoking approved status.

5.5.7 Removal and appeals

SA Water is committed to engagement with its Approved Consultants and Approved Superintendents through ongoing dialogue and feedback and will provide reasonable opportunities to improve performance.

Where poor performance continues, the Approved Consultant or Approved Superintendent will be removed from SA Water's applicable rating list. From that point, the Approved Consultant or Approved Superintendent may only complete development works for which it has already been formally engaged.

Performance considered by SA Water to be egregious will result in removal after one written warning. Such conduct includes, but is not limited to:

- Professional negligence;
- Serious safety breaches;
- Undertaking design activities not permitted under this Technical Standard without a TDRF;
- Attempting to transfer responsibility for design outcomes to SA Water contrary to the requirements of this Technical Standard.

Where opportunities to improve have not resulted in the necessary improvement, SA Water reserves the right to rate or remove an Approved Consultant or Approved Superintendent at its sole discretion.

Decisions made by SA Water under this section are final and are not subject to appeal.

6 Delivery requirements – SA Water projects

This section outlines SA Water's requirements for the planning, development, review and acceptance of Design Workstreams and Technical Consulting Workstreams undertaken for SA Water projects, regardless of the commercial mechanism by which they are delivered (D&C, ECI etc.).

6.1 Application and workstream classification

For the purposes of this section, Technical Work shall be classified as either a Design Workstream or a Technical Consulting Workstream in accordance with Table 17.

Table 17: Workstream Classification

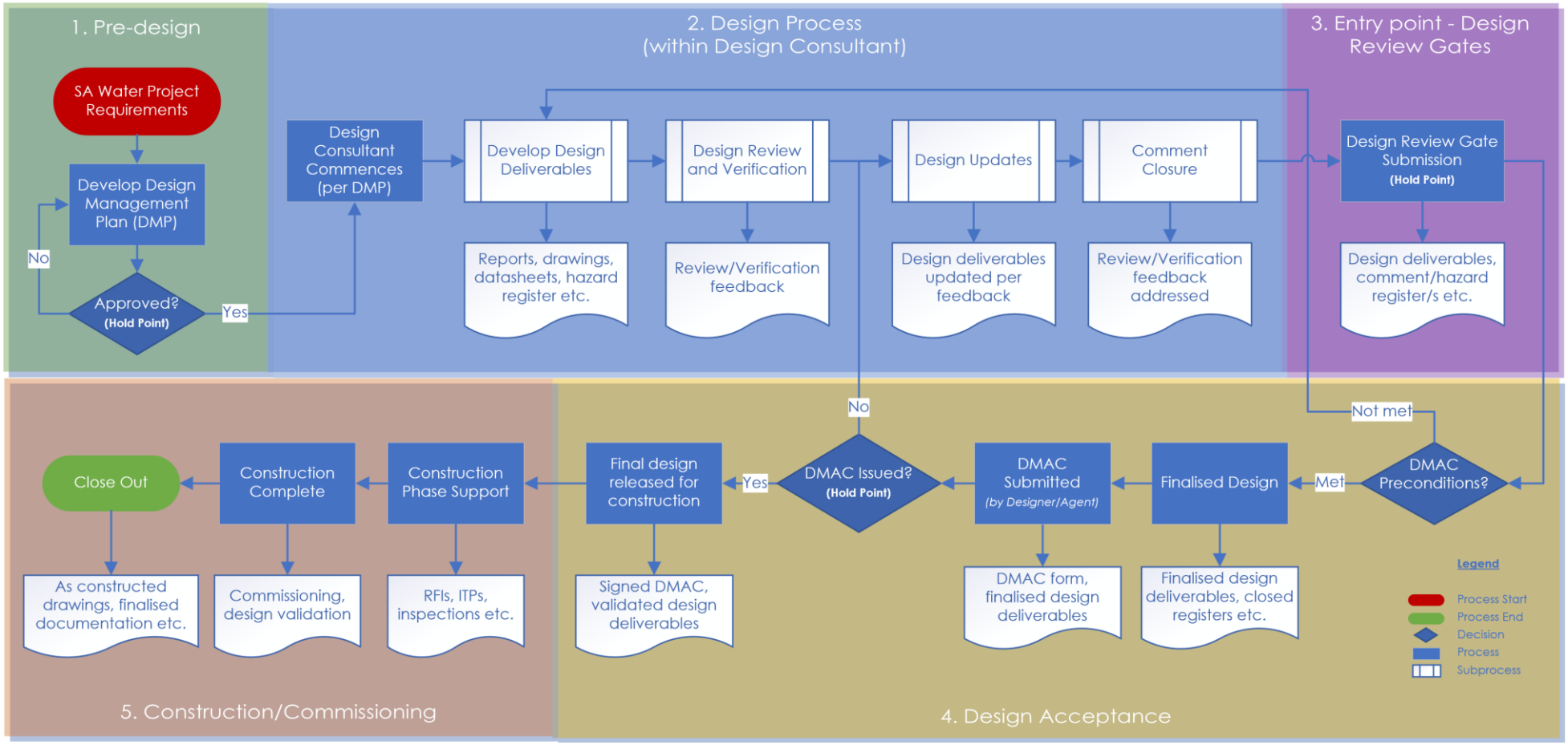
Workstream	Application
Design Workstream	Technical Work undertaken for the purpose of developing, modifying or verifying a design solution. Design Workstreams shall be managed in accordance with Section 6.2.
Technical Consulting Workstream	Technical Work undertaken to provide information, analysis, advice, recommendations, requirements or specifications to support decision-making, procurement or future design activities. Technical Consulting Workstreams shall be managed in accordance with Section 6.3.

Where a single engagement contains both workstream types, each workstream shall be identified and managed in accordance with its applicable requirements. The applicable Design Management Plan (DMP) and/or Consulting Management Plan (CMP) shall identify the classification and deliverables associated with each workstream and cover the entire scope of the engagement.

6.2 Design Workstreams

The Design Workstream delivery process for SA Water projects is summarised in Figure 2, from design planning and development through review, acceptance, construction and close-out. The requirements for each stage are detailed in the following sections.

Figure 2: Design Workstream delivery process (SA Water projects)



6.2.1 Design Management Plans

Where a Design Workstream is being undertaken, a Design Management Plan shall be developed by the Design Consultant in accordance with its QMS and submitted to the Representative for approval. Design activities shall not commence until the DMP **HOLD POINT** has been released by the Representative. Failure to comply with this requirement may result in a non-conformance being raised against the Agent and Design Consultant.

The DMP establishes how the Design Workstream will be planned, coordinated, assured and delivered, including its scope, deliverables, responsibilities, interfaces, programme and applicable Technical Consulting Workstreams.

The SA Water Representative will engage with the Owner's Engineer for review and feedback on the DMP before releasing the hold point. Where the Agent is a Constructor (for example, in an SA Water D&C contract), the Agent shall have been involved in developing, reviewing and endorsing the DMP before submission to SA Water. If multiple consultants have been engaged by the Agent, the DMP shall be a single, consolidated document with input from all consultants, as well as the Agent.

Reduction of the DMP scope nominated in Table 18 without an approved TDRF is only permitted when:

- SA Water is the Agent engaging the Design Consultant directly **and**
- Supply chain support is not required, per SAW-PR-0006 (internal SA Water use only).

6.2.2 Program level Design Management Plans

Recognising that SA Water delivers programs of works across certain infrastructure types, DMPs may be generated at program level, rather than for individual projects, where all of the following conditions are satisfied:

- The program is for a single infrastructure type (for example, water main relays) and all infrastructure within the program has an ACR ≤ 3.
- SA Water's Project Requirements have been prepared on the basis of delivering a program of works and nominate the infrastructure scope accordingly; and
- The approach is endorsed by the SA Water Representative and the Owner's Engineer.

6.2.3 Design Management Plan requirements

The DMP shall be proportionate to the scope, complexity and risk of the work being undertaken and shall identify, as a minimum, the items shown in Table 18.

Table 18: Design Management Plan Requirements

Section	Title	Requirement	Notes
1.0	**Engagement Scope**[1]	Scope of engagement, including references to SA Water's Project Requirements and any exclusions, limitations or prerequisites.	Identify Design Workstreams and applicable Technical Consulting Workstreams.
2.0	**Investigations required**	Investigations and analysis necessary to produce the deliverables.	May include geotechnical investigations, condition assessments, modelling etc.
3.0	**Roles & responsibilities**	Roles and responsibilities of Consultant's team in roles defined by this Technical Standard.	Include coordination between other Consultants and equipment vendors.
4.0	**Resourcing**	Composition of the design team and details of subcontractors or subconsultants.	Include an organisation chart and evidence that capability and experience align with this Technical Standard[2].
5.0	**Deliverables**	List of design deliverables, separated into suitable project/program/package elements, including the anticipated design stage at which each deliverable will be submitted.	The level of detail shall be sufficient to establish the intended scope of each design submission and enable SA Water to identify the review and OE inputs required.
6.0	**Costs**[3]		Separated into elements as required.
7.0	**Required information**	Information required from the Agent.	For example, models, survey data etc.
8.0	**Work breakdown structure**	Work breakdown and resource plan sufficiently detailed to monitor progress against deliverables.	Appropriate allowance to be made for review and SiD actions to be addressed and closed.
9.0	**Delivery Strategy**	Programme and sequencing of design activities, design review gates and issue milestones.	Noting minimum SA Water timeframes, define any planned discipline-specific, package-specific or staged acceptance submissions.
10.0	**Risks and opportunities**	Project risks and opportunities and how they will be mitigated or realised.	Include legislative and external approval risks where applicable.
11.0	**Key Stakeholders**[3]	Identify required stakeholder expertise, its source and arrangements for obtaining input.	May include design review, operations, construction, temporary works and commissioning expertise. Where required expertise is not available from an appointed project stakeholder, identify how that expertise will otherwise be obtained.
12.0	**Interface Management**	Interfaces between disciplines, workstreams, packages, contracts, stakeholders, vendors and SA Water, including controls for discipline interfaces progressing at different rates.	For example, the Consultant, Agent, key stakeholders, technical disciplines, equipment vendors and SA Water.

Section	Title	Requirement	Notes
13.0	**Quality Assurance**	Quality assurance activities	To be undertaken in accordance with this Technical Standard.
14.0	**Design Milestone Acceptance Strategy**	Basis on which Design Milestone Acceptance will be sought, including whether acceptance will apply to the complete multidisciplinary design or to separately identified disciplines, packages or stages.	Where separate Design Milestone Acceptance is proposed, identify the intended acceptance sequence and how interfaces with other disciplines, packages or stages will be managed.
15.0	**Project Controls**	Controls to be implemented, the party accountable for them, and methods used to monitor compliance.	May include checklists, transmittals and document collation.

Notes:

1) Exclusions, limitations and prerequisites shall be specific to the engagement and shall not exclude or qualify responsibilities otherwise assigned to the Design Consultant under this Technical Standard, the Project Requirements or the terms of the engagement. Where an exclusion, limitation or prerequisite relates to unavailable information, the information required, the party responsible for providing/obtaining it, and its effect on the design shall be identified.
2) Demonstration of this requirement shall also include submission of focused CV's, showing information on comparable designs undertaken and resulting project outcomes (client feedback/referees are encouraged)
3) Not applicable for D&C or ECI contracts (where information is addressed within contract documentation)

6.2.4 Changes to Design Management Plans

Changes to a DMP after release of the initial hold point shall be classified and actioned as shown in Table 19. Where a DMP is changed after release of the initial hold point, the Design Consultant shall identify, in the revised DMP submission, the changes made, the rationale for these changes and how the requirements of this Technical Standard will be achieved.

Table 19: DMP change categories

Change	Description	Approval Requirements
Major	A fundamental change to original DMP resulting in: • ≥30% of the document being altered (as judged by the Representative); OR • Changes to Reviewer or Verifier personnel (including addition of new engineering disciplines); OR • Reduction in design deliverables, interface management or quality assurance; OR • Increased design costs; OR • Changes to the approved design review gate strategy, multidisciplinary interface management arrangements, design packaging arrangements or design milestone acceptance strategy(1)	Resubmit for acceptance under Section 6.2.1.
Minor	Updates to the DMP made to reflect the evolution of SA Water's requirements, which are not considered to be major changes.	The Representative to be provided with 5 business days' notice before changes are implemented. This requirement is a **WITNESS POINT** under this Technical Standard.

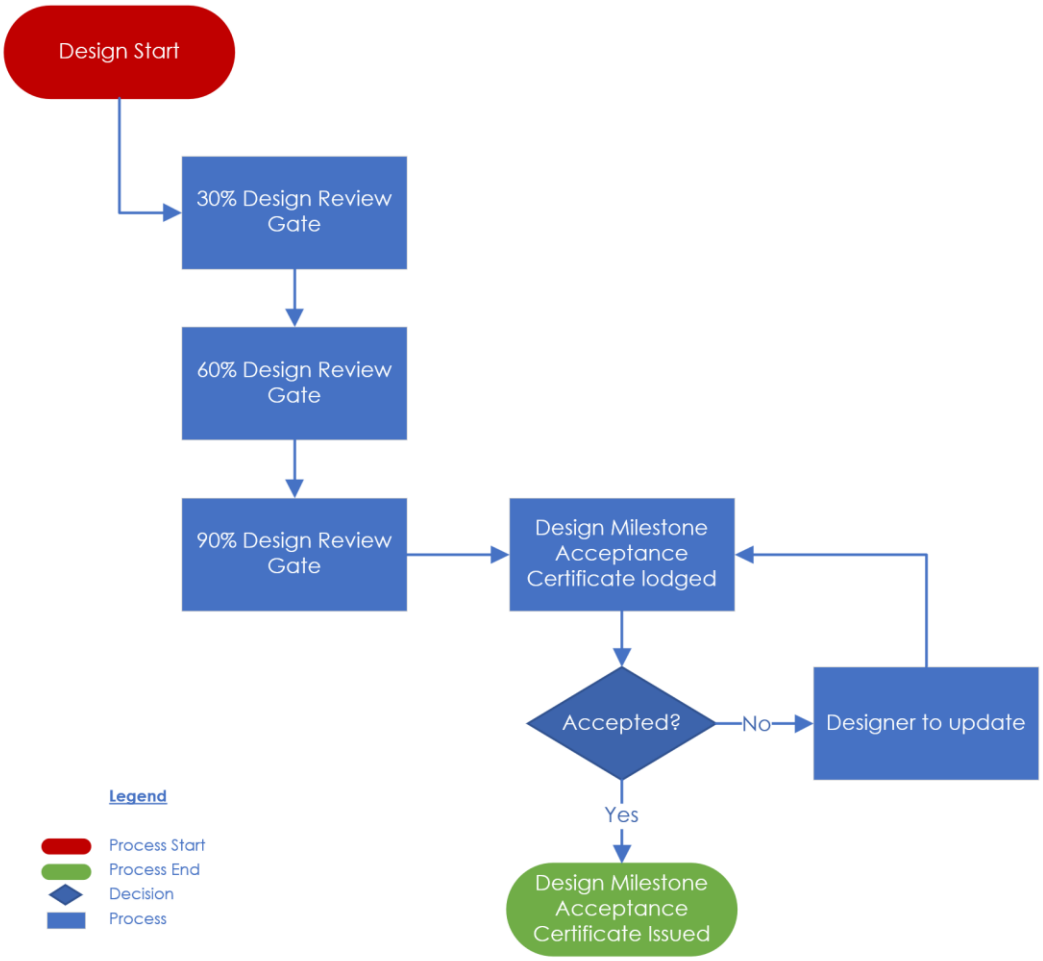
Notes:

1) Changes that alter the approved strategy for progression through design review gates or design milestone acceptance require an approved TDRF prior to implementation.

6.2.5 Design review and acceptance

The design review and acceptance process, shown in Figure 3, ensures design deliverables are robust, coordinated and satisfy SA Water's Project Requirements. The process provides assurance that design completeness, integration, safety and technical risks have been appropriately assessed prior to release for construction, while remaining scalable to the size, complexity and risk profile of the project.

Figure 3: Overview of design review and acceptance process*



*Progression between design review gates is subject to acceptance of the preceding design stage in accordance with Section 6.2.8.

6.2.6 Design review gates

The design review gates provided in Table 20 each represent a **HOLD POINT** at key stages of the design lifecycle. At each gate, the Designer shall submit the design deliverables defined in SA Water's Project Requirements to the SA Water Representative for review and feedback.

These gates provide a structured opportunity to:

- Confirm alignment with technical, operational, and project objectives.
- Assess design completeness and integration.
- Identify and manage risk.
- Initiate Value Management and Safety in Design activities.

Where the Agent is a Constructor, the design shall be reviewed by the Agent prior to submission to SA Water, which may occur in parallel to the Design Consultant's internal review processes.

Table 20: Design review gates

Design review gate	Description	Objectives(1)
30%	General arrangement and configuration of key design elements determined, to establish a realistic baseline for cost and schedule.	• Major design elements and layout established • Operational and performance requirements incorporated • Key design decisions taken • Baseline cost and schedule established • Confirmation that project objectives can be delivered within time, cost, and space constraints • Identification of all major risks, with ownership assigned and plans in place to address these.
60%	Technical aspects of design materially complete, to enable design refinements through review, constructability and SiD activities.	• Detailed integration of major design elements and key design decisions with supporting technical components • Demonstrated maturation of operational/control requirements and interfaces to integrate design with existing/connected infrastructure • Design computations/modelling materially complete • Pre-requisites to undertaking SiD hazard review 2 (for example, finalised equipment selections, structure dimensions etc.) satisfied. Refer TS 0101.
90%	Design essentially complete, excepting final refinements.	• Comments and actions from previous review gates largely (if not completely) addressed. • Design refinements from SiD activities, constructability reviews etc. implemented • Major risks demonstrably addressed • Fully resolved design incorporating finalised operational/control requirements and interfaces.

Notes:

1) The objectives provided represent the net outcome of the design deliverables, SiD and value management activities undertaken for a given stage of design.

These gates correspond to the level of design maturity rather than linear percentage completion. Deliverables, expectations, and timing shall be proportionate to the project complexity and defined in the DMP.

A **minimum of 10 business days** shall be allowed for SA Water's review after a complete submission is received. A longer review period may be agreed with the SA Water Representative where the size, complexity or multidisciplinary nature of a submission requires it. A shorter timeframe may be considered at SA Water's discretion, where[13]:

- The revised timeframe is formally recorded in the Design Management Plan (DMP); and
- The SA Water Representative has obtained agreement from the Owner's Engineer confirming that the proposed timeframe is achievable; and
- The review timeframe is **not less than five business days**, except where the design forms part of a formal SA Water Incident Management Team response.

Delays attributable to the Designer or Constructor **will not** be accepted as justification for requesting or imposing accelerated review timeframes on SA Water unless otherwise agreed.

[13] A TDRF is not required where these conditions are satisfied.

6.2.7 Application of design review gates

Design review gates may be adjusted to suit varying scale and risk profiles of SA Water projects where the applicable conditions of Table 21 are satisfied. In all scenarios, the requirements of this Technical Standard and TS 0101 remain applicable, and the approved DMP shall identify and justify the adopted approach.

Misuse of these scenarios or failure to comply with their conditions may result in a non-conformance being raised against the Agent and Design Consultant.

Table 21: Variations to design review gates

Scenario No.	Description	Permitted Adjustment	Conditions
1	Projects using SA Water Standard Drawings	Remove the 30% and 90% design review gates without TDRF.	All works are delivered within the scope of existing SA Water Standard Drawings.
2	Projects using SA Water Typical Drawings	Remove the 30% design review gate without TDRF.	All works are delivered within the scope of existing SA Water Typical Drawings.
3	Rehabilitation projects using SA Water standards	Remove the 30% and 90% design review gates without TDRF.	All works are delivered within the scope of TS 0400 and, where applicable, the relevant parts of the TS 0711 suite.
4	Streamlined design review gates	Merge the 90% design review gate with design acceptance without a TDRF.	• ACR is 3 or less; • Written agreement from the SA Water Representative and Owner's Engineer is documented in the approved DMP • All design acceptance preconditions are satisfied.
5	Reduced design review gates via TDRF	Remove one or more design review gates.	• TDRF explains management of design risks • Endorsement of proposal obtained from SA Water Representative and Owner's Engineer • Where the Agent is a Constructor, acknowledgement that SA Water is not liable for delay or rework arising from matters that would reasonably have been identified at removed gates.

6.2.8 Design review gate outcomes

Design review gate artefacts may include design comment registers, updated SiD hazard registers, HAZOP or CHAZOP outputs, and drawing/report mark-ups.

Following completion of each design review, the SA Water Representative shall issue the review artefacts and advise the Design Consultant of the review outcome. This constitutes formal release of the applicable design review gate hold point and permits the design to progress to the next design review gate.

Before issue, the SA Water Representative or delegate shall confirm that review comments:

- Are clear, concise and consistent with the objectives of this Technical Standard;
- Relate to the adequacy of the design and its satisfaction of SA Water's Project Requirements, Technical Governance and the Contract; and
- Do not contain unresolved duplication, contradiction or error.

The design comment register shall record issues identified through SA Water's review that require consideration or action by the Designer, with comments classified in accordance with Table 22. General discussion, requests for information and matters that do not relate to the adequacy of the design shall not be recorded as review comments.

The cumulative effect of review comments may indicate that the design has not achieved the maturity, completeness, coordination, review or verification required by the applicable design review gate, irrespective of the classification of individual comments. Where responses are inadequate or identified deficiencies recur, the matter may be managed as a non-conformance in accordance with this Technical Standard.

Table 22: Review comment categories

Comment category(1)	Description	Issue identified(3)
Critical	An issue that materially affects the ability of the design to satisfy the requirements of the applicable design review gate	• Non-conformance with SA Water's Project Requirements, Technical Governance, applicable legislation or the Contract. • Insufficient design maturity or supporting technical evidence. • Material errors, omissions or contradictory information. • Unresolved interfaces or incomplete coordination that materially affect the design. • Required Designer, Reviewer or Verifier activities or authorisations not completed in accordance with this Technical Standard.
Non-critical(2)	An issue requiring consideration or action by the Designer that does not materially affect the ability of the design to satisfy the requirements of the applicable design review gate	• Minor technical or documentation issues. • Incomplete or inconsistent information that does not materially affect the design outcome. • Additional detail or clarification required as part of subsequent design development.

Notes:

1) Comment classification shall be based on the materiality of the identified issue to the applicable design review gate.
2) Classification of a comment as non-critical **does not make the comment optional**. Review comments shall be addressed and closed in accordance with Sections 6.2.9 and 6.2.10.
3) The issues identified are illustrative and are not exhaustive.

6.2.9 Design progression

For multidisciplinary projects, design disciplines shall progress through design review gates in a coordinated manner in accordance with the DMP.

Where interfacing disciplines, packages or stages are planned to progress through design review gates at different stages, the affected interfaces shall be managed in accordance with the approved sequencing and interface management arrangements documented in the DMP.

Progression that is inconsistent with the approved sequencing or interface management arrangements documented in the DMP shall require approval through a TDRF before proceeding. Designs shall not progress beyond a design review gate while:

a. A critical comment raised at the preceding design review gate remains open; or

b. The cumulative effect of unresolved comments (whether critical or non-critical) indicates that the design has not achieved the maturity, completeness, coordination, review or verification required by the applicable design review gate.

Progression of design development shall occur as provided in Table 23, noting that **all** review comments applicable to the design shall be closed before Design Milestone Acceptance.

Table 23: Progression requirements for open comments

Comment category	Requirements for design progression if comments are not closed
Critical	• A clear closure action and timeframe are documented and; • The SA Water Representative provides written approval, endorsed by the Owner's Engineer.
Non-critical	• May remain open during progression between intermediate design review gates, provided their resolution is documented as part of subsequent design development.

Closure of a review comment requires the Designer to:

- Update the applicable design deliverable or provide other evidence demonstrating that the comment has been addressed; and
- Obtain acceptance of the resolution from the person who raised the comment or their delegate.

6.2.10 Design milestone acceptance

SA Water's acceptance of final design deliverables is recorded through the Design Milestone Acceptance Certificate (DMAC), which represents the final **HOLD POINT** prior to construction. Given the criticality of its function, dispensation requests to remove this hold point will not be accepted.

Design milestone acceptance should ordinarily be sought for the complete multidisciplinary design package associated with the applicable design review gate. Where Design Milestone Acceptance is sought for a discipline, package or stage independently of the complete multidisciplinary design, the submission shall:

a. Be consistent with the approved design milestone acceptance strategy documented in the DMP;

b. Represent a complete and coherent design package suitable for acceptance; and

c. Demonstrate that interfaces with other disciplines, packages or stages have been coordinated and incorporated into the design or are being managed in accordance with the approved DMP.

Design Milestone Acceptance that is inconsistent with the approved Design Milestone Acceptance Strategy or interface management arrangements documented in the DMP shall require approval through a TDRF before submission.

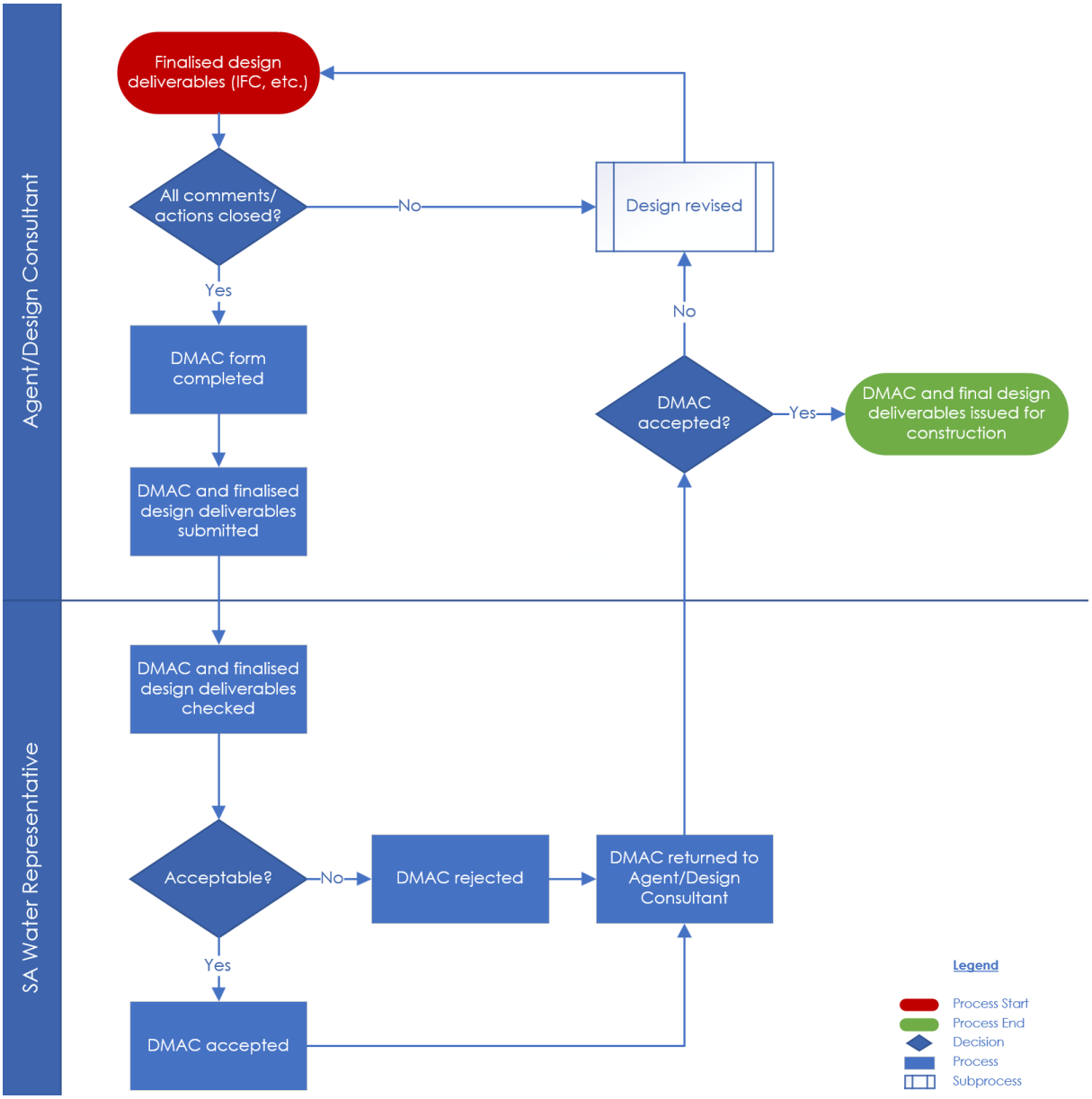
All review comments applicable to the design deliverables submitted for Design Milestone Acceptance shall be closed before the DMAC is submitted. Comments shall not remain open against deliverables issued for construction.

- DMAC applications lacking full comment closure shall be returned without review and may be managed as a non-conformance in accordance with this Technical Standard.

Acceptance of a discipline, package or stage **does not** remove the obligation to maintain multidisciplinary design coordination or update accepted deliverables where subsequent coordination identifies a required change, nor the responsibilities established in Section 4.3.7.

Final design deliverables, including design reports and IFC drawings, are **invalid** unless accompanied by a DMAC endorsed by the Owner's Engineer[14] and signed by the SA Water Representative. The completed DMAC workbook, including its Deliverables Schedule, shall be digitally signed and retained as the authoritative record of Design Milestone Acceptance.

Figure 4: DMAC submission process



[14] Where an SA Water Owner's Engineer role is present on a project, per section 4.3.7

6.2.11 Escalation of unresolved issues

Where technical or scope-related misalignments cannot be resolved through design review or clarification, they shall be escalated by the SA Water Representative (or delegate) using the pathways shown in Table 24 and the form provided in Appendix E.

Design liability remains with the Design Consultant. No design liability transfers to SA Water through escalation unless accompanied by an approved TDRF. Where decision-makers cannot agree, the SA Water Representative shall escalate the matter to the next level in SA Water's management structure.

Table 24: Escalation pathways

Issue type	Escalation	Notes
Project scope	To Project Sponsor	Further escalation may be required where the impact exceeds the Project Sponsor's delegation.
Technical	To SA Water Representative, then Project Sponsor	Applies to a technical opinion or interpretation misalignment not arising from a project scope exclusion. The Designer shall provide evidence-based technical justification before escalation.

Where a misalignment arises from an exclusion or limitation in SA Water's Project Requirements, the Designer shall provide contextual documentation to support resolution.

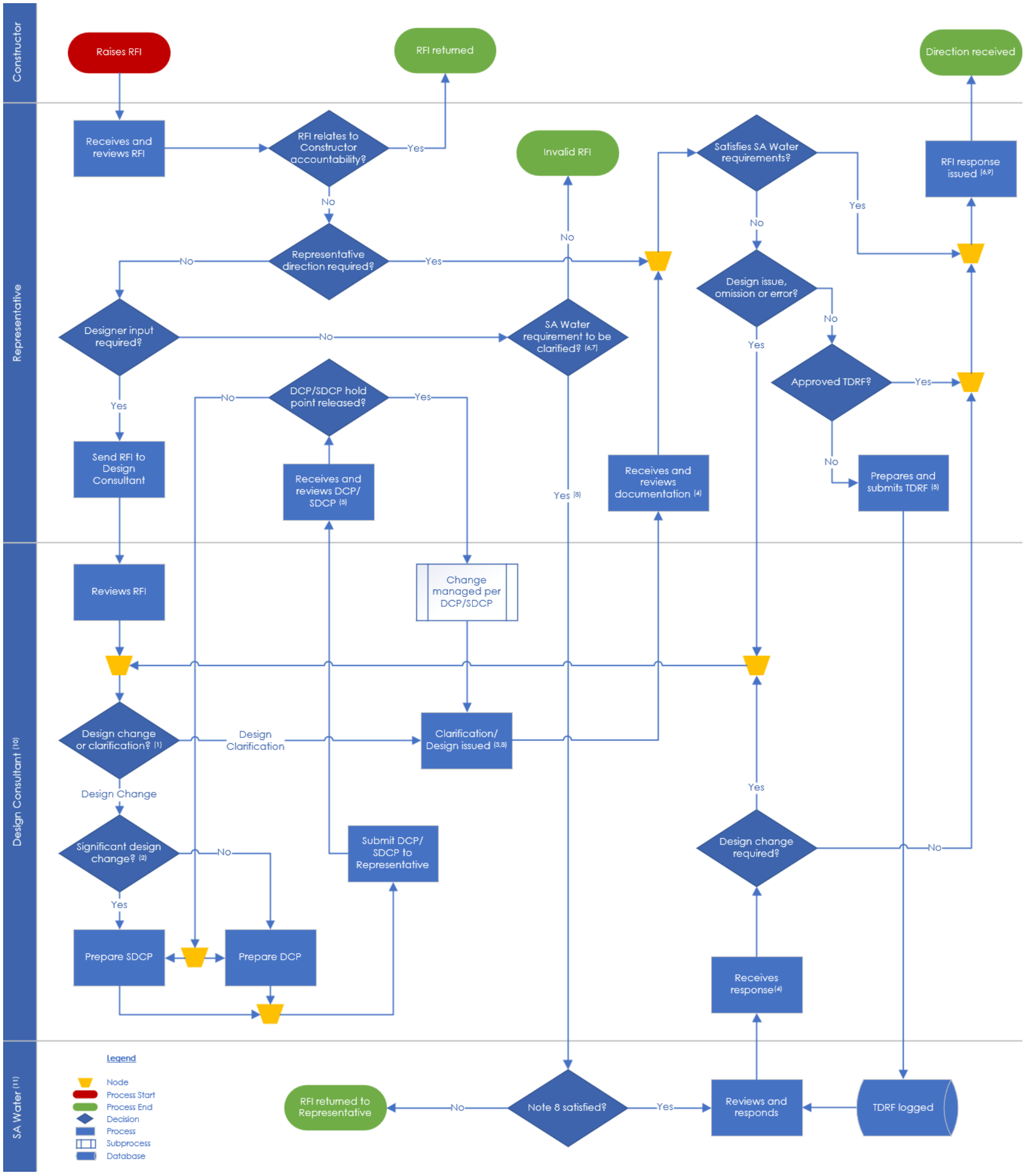
6.2.12 Design change management

After design deliverables have been issued for construction, changes shall be assessed and approved in accordance with this section and Figure 5. Where uncertainty exists as to whether a proposed change is a Design Change or Significant Design Change, it shall be treated as a Significant Design Change[15].

Where clarification of SA Water's requirements is required, the Designer shall present the available options and their implications to the Owner's Engineer or Responsible Discipline Lead. SA Water may clarify its requirements but will not develop the design solution on behalf of the Designer. For SA Water projects, engagement with the Design Consultant shall occur through the Agent.

[15] SA Water reserves the right to require a proposed Design Change to be assessed and submitted as a Significant Design Change.

Figure 5: Design change process (RFI initiated)



Notes:

1) Refer Section 6.2.12 for details of design changes.
2) Where uncertainty exists as to whether a proposed change constitutes a Design Change or Significant Design Change, the change shall be treated as a Significant Design Change
3) Design updates may be provided as red line markups, subject to the requirements of Section 6.2.12.3
4) This represents a check of Designer output, noting this does not relieve the Designer of their responsibilities or obligations under this Technical Standard to ensure SA Water requirements are satisfied.
5) During the construction phase of land development projects, DCPs, SDCPs and TDRFs are managed by the Representative.
6) For land development projects, formal instruction to the Constructor shall be provided via the Developer
7) Requirement may be SA Water Project Requirements or Technical Governance
8) Where clarification of a requirement is sought from SA Water's Owner's Engineer or Responsible Discipline Lead, submissions shall present the available options and their implications.
9) For land development Projects, the Construction Services Technical Officer, Account Manager and Reticulation Networks shall be copied on correspondence
10) For SA Water works, interface with the Design Consultant is via the Agent.
11) SA Water's Owner's Engineer or Responsible Discipline Lead as applicable.

6.2.12.1 Design Changes

A Design Change is a modification to an issued for construction design which does not alter the approved design intent, adopted solution, risk profile, performance requirements and stakeholder requirements.

Where a Design Change is required, the Designer shall prepare and submit a Design Change Proposal (DCP) to the Representative. Submission constitutes a **HOLD POINT** and the change shall not be implemented until the hold point has been released.

The DCP shall identify:

- affected stakeholders and the timing of consultation;
- design activities to be undertaken and deliverables to be produced or updated;
- proposed arrangements for SA Water review and acceptance; and
- assessment and documentation of change impacts in accordance with TS 0101.

Approval of a Design Change does not require a new DMAC, provided the change remains within the definition of a Design Change under this section. The changes in the approved DCP shall be implemented in accordance with Section 6.2.12.3.

6.2.12.2 Significant Design Changes

A Significant Design Change is a modification to an issued for construction design that materially alters the approved design intent, adopted solution, risk profile, performance or stakeholder requirements, such that the basis on which the design was reviewed, verified or accepted requires reconsideration.

In determining significance, consideration shall be given to the nature, scale and consequence of the change, including whether it[16]:

- Changes the basis, configuration, functionality, design assumptions or performance requirements of the approved design;
- Introduces or materially changes technical, safety, operational, constructability or interface risks;
- Requires material revision of calculations, modelling, assessments or investigations;
- Affects compliance with SA Water's Project Requirements or Technical Governance; or
- Materially affects other disciplines, infrastructure interfaces or stakeholder requirements.

Where a Significant Design Change is required, the Designer shall submit a Significant Design Change Proposal (SDCP) to the Representative. Submission constitutes a **HOLD POINT** and the change shall not proceed until the hold point has been released.

The SDCP shall define the scope and basis for redevelopment of the design, including:

- The nature and rationale for the proposed change;
- Impact on SA Water's Project Requirements;
- Investigations, calculations, modelling or assessments requiring revision;
- Affected stakeholders and consultation requirements;
- Design activities and deliverables to be produced or revised; and
- Design review, verification and acceptance activities that remain valid or are to be repeated.

An approved Significant Design Change shall be implemented in accordance with Section 6.2.12.3.

[16] These considerations are indicative only and shall not be considered as exhaustive.

6.2.12.3 Design change implementation

For a Design Change, updates may be provided as red-line mark-ups of previously accepted IFC deliverables, subject to the document version control requirements of Section 4.5. All approved Design Changes shall be incorporated into finalised design deliverables and as-constructed drawings at project completion.

For a Significant Design Change, affected design deliverables shall be formally revised, reviewed, verified and authorised in accordance with this Technical Standard. Red-line mark-ups may support development and review of the proposed change but shall not be used as the approved design documentation for construction.

Following approval of the SDCP and completion of the required design activities, the affected design deliverables shall be submitted for Design Milestone Acceptance. A revised DMAC shall be issued for the affected design deliverables before the revised design is issued for construction.

6.2.13 Equipment Procurement Exception Forms

The preferred approach is for design inputs, equipment selections, interfaces and other information necessary to support design to be finalised before DMAC certification, with equipment procurement proceeding using the accepted design.

Where circumstances require either procurement before the design is fully developed or design acceptance before final equipment selection, the Design Consultant shall prepare and maintain an Equipment Procurement Exception Form (EPEF). Only one exception scenario is permitted for each equipment package.

Part A shall document the due diligence supporting the proposed approach, including the basis of design, assumptions requiring confirmation, sensitivity to foreseeable variation, retained design flexibility and the applicable control points for design confirmation. Submission of Part A constitutes a **HOLD POINT**. Acceptance authorises only the activity identified in the EPEF and does not constitute a DMAC, release another hold point or remove outstanding design activities.

An application for Design Milestone Acceptance using an EPEF shall satisfy the design acceptance requirements except for the assumptions and deliverables expressly recorded in the EPEF. It shall not defer unrelated design activities, avoid closure of SiD actions or design review comments, or bypass other requirements. Failure to disclose an applicable open EPEF is a non-conformance and the application shall be returned without review.

The party responsible for equipment procurement shall provide final equipment information in sufficient time for the Design Consultant to confirm the assumptions recorded in Part A before the applicable control points are reached. The Design Consultant shall complete Part B by assessing the final equipment information against the accepted basis and confirming whether each assumption remains valid.

Where the final equipment information is inconsistent with the accepted basis or falls outside the retained design flexibility recorded in Part A, the Design Consultant shall assess and manage the resulting change in accordance with the applicable Design Change or Significant Design Change requirements. This shall include any required review, verification, SiD activities, approvals, interface coordination and updates to affected design deliverables.

Completion of Part B records the Design Consultant's confirmation that the assumptions in Part A have been addressed and that consequential design activities have been completed. Part B does not constitute SA Water acceptance of the design or transfer responsibility from the Design Consultant or Constructor. The Constructor shall ensure that Part B is completed before the affected equipment is incorporated into the works.

Failure to complete the required design confirmation or consequential design activities may result in a non-conformance under Section 7.

6.3 Technical Consulting Workstreams

6.3.1 Consulting Management Plans

Where Technical Consulting Workstreams are being undertaken, a Consulting Management Plan (CMP) shall be developed by the Consultant and submitted to the SA Water Representative at least 10 business days before consulting activities are due to commence. Submission and acceptance of the CMP constitutes a **HOLD POINT** under this Technical Standard.

The CMP establishes how the Technical Consulting Workstream will be planned, coordinated, reviewed, verified and accepted.

6.3.2 Consulting Management Plan requirements

The CMP shall be proportionate to the scope, complexity and risk of the work being undertaken and shall identify, as a minimum:

- Deliverables;
- Review stakeholders;
- Review requirements;
- Verification requirements (where applicable);
- Deliverable issue milestones;
- Comment closure requirements;
- Final acceptance requirements; and
- Applicable hold points.

Technical Consulting Workstream deliverables shall undergo internal review in accordance with Section 4.4.2.2. Where additional verification is required because a deliverable establishes, informs, constrains or validates a design solution, or due to the nature, complexity or technical risk of the work, the applicable verification requirements shall be identified in the CMP.

Where verification is required, it shall be undertaken in accordance with Section 4.4.2.3. The CMP shall identify the verification activities to be completed, the Verifier, the evidence to be provided and the point at which verification is required before final issue.

6.3.3 Draft deliverables

Draft deliverables in Technical Consulting Workstreams shall be reviewed before final issue so stakeholders can assess technical adequacy, provide feedback and confirm that SA Water's Project Requirements have been satisfied.

Submission of draft deliverables in accordance with the CMP constitutes a **HOLD POINT**. The deliverables shall not progress to final issue until SA Water's review comments have been returned or the hold point has otherwise been released by the Representative. Release of this hold point permits progression towards final issue but does not constitute final acceptance.

6.3.4 Review and comment closure

Review comments shall be documented and returned by the Representative for action by the Consultant. Comment closure requires the Consultant to update the deliverable or provide other evidence addressing the comment and acceptance of the resolution by the person who raised it (or their delegate).

Following review, comments shall be accepted and closed, carried forward with agreement, or escalated where resolution cannot be achieved. Where the Consultant does not accept a comment, the basis shall be documented and resolution sought from the person who raised it via the Representative.

Unresolved comments that may affect compliance with SA Water's Project Requirements, Technical Governance, future design inputs, procurement requirements or asset outcomes shall be escalated to the Representative. Submissions lacking adequate closure evidence may be returned without review or raised as a non-conformance to this Technical Standard.

Where resolution cannot be achieved through the review and clarification process, the matter shall be escalated using the applicable pathways and Issue Escalation Form described in Section 6.2.11.

6.3.5 Acceptance of final deliverables

Acceptance by the Representative confirms that the agreed review process is complete, comments have been addressed and the deliverable is suitable for its intended purpose.

The Consultant shall submit the final deliverable to the Representative for acceptance. Applications for acceptance shall include evidence that review comments have been closed, required verification activities are complete, and quality assurance, checking, review, verification and authorisation requirements have been satisfied.

Acceptance by the Representative does not relieve the Consultant of responsibility for the technical adequacy, completeness, coordination or compliance of the deliverable.

6.4 Performance management

SA Water manages the performance of its Engineering and Automation Panels through formal and informal reviews, management meetings, project feedback, supplier performance information, audits, project close-out records and non-conformances. The applicable review cadence and requirements are defined in the management planning documents for each panel.

6.4.1 Audits

SA Water reserves the right to conduct ad hoc audits of quality systems or technical deliverables of its Engineering and Automation Panels.

6.4.2 Project feedback and continuous improvement

Where a quality issue arises in a Consultant's delivery of a deliverable, the project team shall contact the Consultant in the first instance to seek resolution. A non-conformance shall be raised where the issue is substantiated and remains unresolved, requires escalation, or where quality concerns recur on Technical Work of the same type or scope within a 12-month period.

7 Management of non-conformances

The identification of non-conformances represents a continuous improvement opportunity to address shortcomings in systems, processes or training that contributed to a failure to satisfy applicable requirements. The requirements of this section apply to Consultants undertaking Technical Work for SA Water projects.

7.1 Application

The non-conformance process described below applies to issues arising from Technical Work undertaken for SA Water projects where the requirements of this Technical Standard have not been satisfied. Some typical examples are provided in Table 25 for guidance in the application of the non-conformance process.

Table 25: Examples of applying TS 0104 NCR Process*

Scenario	Applicable NCR Process	Relevant TS 0104 Section	Notes
Design deliverable does not satisfy applicable requirements	TS 0104	4.3.2 (Design Consultant) 4.4 (Quality management)	Applies where an issued design deliverable is subsequently found not to satisfy applicable requirements.
Technical Consulting deliverable does not satisfy applicable requirements	TS 0104	4.3.3 (Designer / Author) 4.4 (Quality management) 6.3 (Technical Consulting Workstreams)	Applies where an issued Technical Consulting deliverable is subsequently found to contain a material technical deficiency or otherwise not satisfy applicable requirements.
Designer seeks direction from SA Water on how to undertake the design	TS 0104	4.3.3 (Designer / Author) 4.3.7 (Owner's Engineer)	Does not apply to requests for clarification of scope, policy, applicable requirements or interpretation of Technical Governance.
Construction defect identified	Constructor QMS	N/A	
Design deficiency identified during construction	TS 0104	4.3.2 (Design Consultant) 4.4 (Quality management)	
Required construction or commissioning support not provided	TS 0104	4.3.1 (Agent) 4.3.3.2 (Construction phase support (Design Workstreams))	Includes required preparation or review of commissioning documentation, vendor information or other technical support. Excludes SA Water hold-point releases.
Safety Incident	Constructor and SA Water WHS	To be confirmed at time of incident (as applicable)	TS 0104 applicability only where safety incident is the result of a failure of the design to address requirements of TS 0101

*Table is not intended to provide an exhaustive listing of non-conformance scenarios. It provides examples to assist in the application of the TS 0104 NCR process and does not limit its application to the scenarios shown.

7.2 Non-conformance process

This Technical Standard adopts a structured non-conformance process as shown in Figure 6, to document activities which identify, investigate, correct and prevent non-conformances.

Figure 6: Non-conformance overview



7.2.1 Non-conformance form

Where instances of non-conformance to this Technical Standard occur, the online form available on the SA Water Engineering AquaNet site may be utilised by the SA Water Representative (or their delegate).

Submission of a non-conformance form will trigger the workflow shown in Figure 7. While Figure 7 illustrates the process for a Design Workstream, the same process applies to a Technical Consulting Workstream, with the Consultant undertaking the work fulfilling the equivalent role of the Design Consultant.

The NCR will be issued to the Agent that has engaged the Consultant, who shall use this form (along with the corresponding reference number) to work through the non-conformance process of the Consultant's QMS and engage with the SA Water Representative (or their delegate) to reach agreement on its resolution.[17]

- In the event agreement on closure of a non-conformance cannot be reached, the issue may be escalated to the SA Water Engineering Panel Manager.

7.2.2 Non-conformance report

The non-conformance report shall document the investigation, resolution and closure of the identified non-conformance, including the actions required to correct the non-conformance and prevent its recurrence. A finalised non-conformance report shall be issued to SA Water within 10 business days of the non-conformance form being issued and shall, as a minimum:

a. Identify and confirm the non-conformance

b. Establish the root cause of the non-conformance

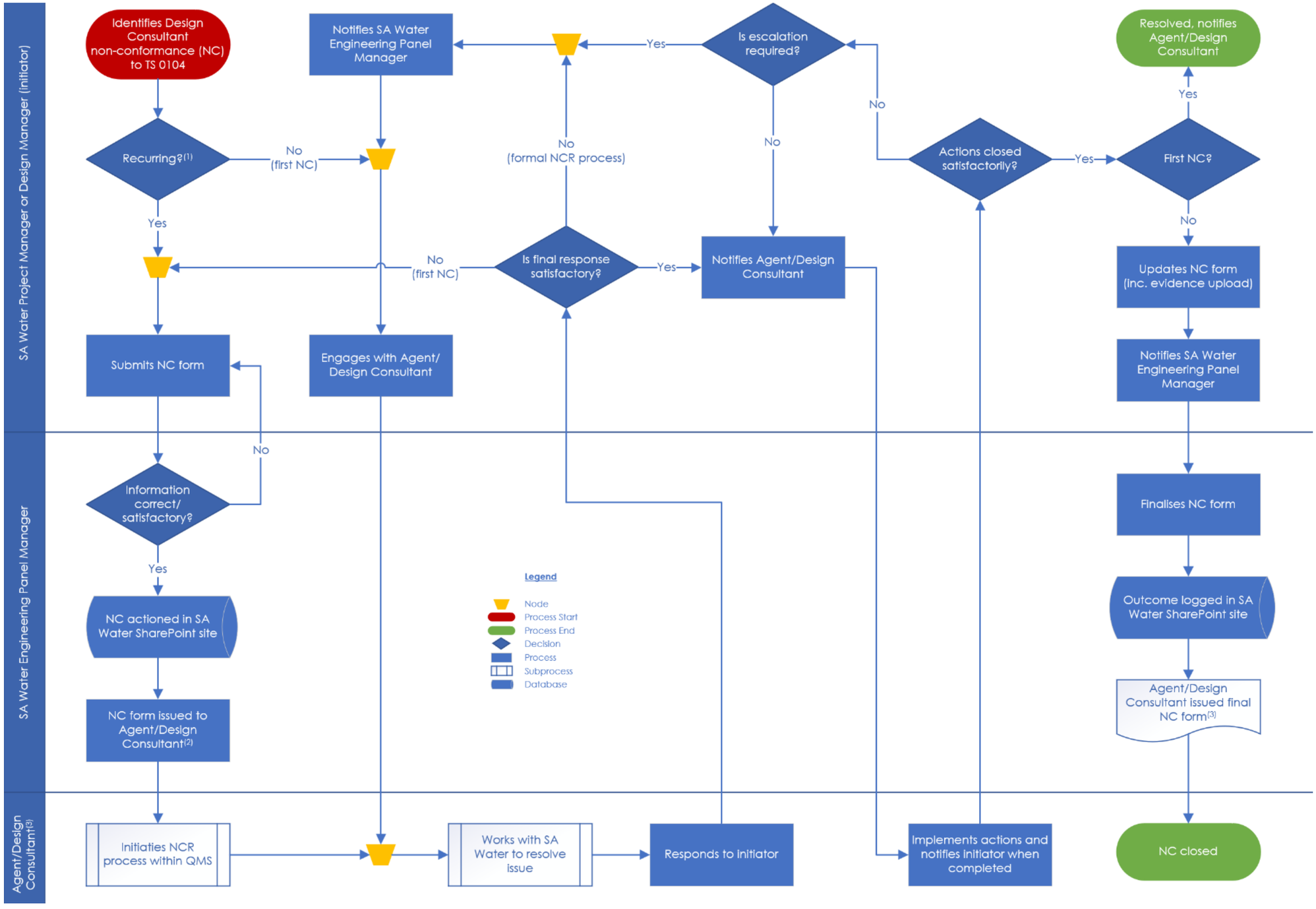
c. Identify the actions proposed to correct or resolve the identified non-conformance. Acceptance of the proposed actions represents a **HOLD POINT** before the agreed corrective actions are implemented and the affected Technical Work proceeds.

d. Identify actions to prevent a recurrence, including responsibility and timeframe for implementation.

Once the NCR is completed, actions agreed and fully implemented, the SA Water Representative (or delegate) shall upload the finalised NCR to SA Water's non-conformance SharePoint site and mark it as being closed.

[17] The SA Water NCR form is intended to give SA Water visibility of TS 0104 non-conformances and is not a replacement for a Consultant's non-conformance process.

Figure 7: Non-conformance process, Design Workstream



Notes:

1) Recurring non-conformance defined as one which has occurred more than once in a single 12 month period.
2) NCR documentation from SA Water will be issued to the Agent. Where the Agent is SA Water, documentation will be issued directly to the Design Consultant.
3) Only NC form will be returned to the Agent/Design Consultant.

Appendix A – Schedule of hold and witness points

Section	Type	Description
4.4.2.1	Witness	Review and verification documentation to accompany technical deliverables
6.2.1	Hold	Approval of Design Management Plan
6.2.10	Hold	Design milestone acceptance certificate
6.2.13	Hold	Equipment Procurement Exception Form Part A
6.3.1	Hold	Acceptance of Consulting Management Plan
6.2.12.1	Hold	Design Change Proposal
6.2.12.2	Hold	Significant Design Change Proposal
6.3.3	Hold	Submission of draft Technical Consulting Workstream deliverables
6.2.4	Witness	Notification of minor changes to Design Management Plan
6.2.6	Hold	Design review gates
7.2.2	Hold	Approval of corrective actions (where an NCR is raised)

Appendix B – Land development design non-conformances

The following guidance identifies major and minor non-conformances for water and wastewater designs in land development projects, as a reference to inform a Design Consultant's quality assurance processes, including design checklists.

This list is not to be considered exhaustive

Due to specific site circumstances, non-conformances beyond those described below may be identified during audits which will be classified as either:

a. A major non-conformance, where the design:
   - Does not satisfy network design or SA Water requirements
   - Has critical design values or data which is missing, unsupported or incorrect
   - Poses a risk to public health, safety (including both SA Water personnel and the general public), environment or cultural heritage

b. A minor non-conformance, where the design contains errors or omissions of details which are critical to the construction, operation or maintenance of infrastructure

Description of non-conformance	Type
Reviewer and Verifier are not CPEng	Major
Drawings have not been properly authorised	Major
Design is not supported by appropriate and correct calculations (for example, hydraulic design)	Major
Design has been completed without verifying the conditions and measurements at connection points	Major
A non-standard design has been undertaken without prior approval from SA Water	Major
Design has not been assessed against odour and corrosion risk, or has failed to identify appropriate mitigation measures in accordance with TS 0854	Major
Drawings – Provided with incorrect title block information – Do not comply with TS 0100 – Contain leaders (for example, notes or details) that are split across multiple sheets – Do not provide order of construction details – Contain connection notes, lines, symbols and labels do not match – Contain incorrect/incomplete construction notes – Lack required symbols/Provide incorrect symbols – Do not nominate a compliant co-ordinate system and at least two survey marks – Do not provide tie points (or co-ordinates) for bends and appurtenances	Minor
Total length, diameter, material and pipe class in design: – Is not provided – Is represented incorrectly in longitudinal sections (for example, grade or size) – Is sized incorrectly – Specifies the use of products not approved by SA Water	Major

Description of non-conformance	Type
Drawing notes do not cover charge up, pressure testing or disinfection requirements	Major
Drawings do not provide adequate information about connecting to live infrastructure (for example, contractor qualification requirements, temporary authorisation requirements or specific connection details and instructions)	Major
Pressure zone/s are not: – Labelled correctly – Isolated (where there are two different pressure zones)	Major
Chainage: – Not provided for bends, appurtenances, end fittings of stage boundaries and similar locations – Descriptions do not match layout plans	Minor
SA Water Systems Planning requirements not fully implemented	Major
Allowance for disinfection and testing per TS 0900 has not been made	Major
No adequate provision has been made for the safe and effective construction, commissioning, operation or maintenance of the infrastructure, including where: – isolation valve spacing exceeds the maximum allowable number of allotments; – fireplug spacing exceeds the maximum allowable distances; or – required air release valves are not provided or are incorrectly located.	Major
Thrust blocks: – Are not specified as required – Do not consider local geotechnical conditions – Are not detailed correctly – Are not shown with correct symbol, chainage and description on design	Major
Clearances to other services are: – Not specified – Not compliant with the requirements of TS 0136 – Pose a risk to safety and environment	Major
Mains not available for connection: – Labelled incorrectly – Are provided with customer connections	Major
Connection details: – Are not provided with a details box – Reference connection types incorrectly – Show connection types that do not match the totals – Have non-compliant IP inverts – Do not clearly identify or specific locations of meters	Minor

Description of non-conformance	Type
Longitudinal section: – Does not provide chainages for all structures and bends – Has chainages that do not match the layout plan – Does not provide invert levels for all structures, jump ups and bends – Has branching line inverts that do not match host main inverts – Has incorrect or non-compliant grades, or displays grades incorrectly – Is not provided with design elevation or depth to invert values	Minor
Layout plan: – Not provided – Does not show contract boundary – Does not delineate as constructed, design or survey elevations – Chainages and fittings do not match the longitudinal section	Minor
Provision for firefighting not accommodated in main sizing	Major
Link in/s do not minimise service outage duration, extent or the number of outages required	Major

Appendix C – Design deliverables list

The deliverables lists in this appendix provide SA Water's general expectations for Design Workstream deliverables and do not override the requirements of another SA Water Technical Standard.

The lists are reproduced in this appendix for reference and are not provided as editable templates. Required deliverables shall be determined for each project, specified in SA Water's Project Requirements and formally established through the approved Design Management Plan.

The lists identify the design stages at which deliverables would ordinarily be expected. The applicability and timing of individual deliverables shall be determined having regard to the scope, complexity, risk and delivery approach of the project.

Requirements for durability planning and operation and maintenance manuals are provided in TS 0110 and TS 0132 respectively.

General Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Options Design Report	x					**Mandatory deliverable for optioneering on Tier 1 and 2 projects**
Options Endorsement Part A - Project Options	x*					*This is an IMO deliverable that SA Water Engineering has input into during the Prefeasibility Study. Only required for Tier 1 and 2 projects.
Options Endorsement Part B - Technical Options	x*					*This is an IMO deliverable that SA Water Engineering develops during the Technical Investigation Phase. Only required for Pathway 3 projects.
Scoping Report	x					**Mandatory deliverable for single option Tier 3, Pathway 2 projects**
Functional Specification	x					**Mandatory deliverable**
Design Basis Report		x	x	x	x	**Mandatory deliverable**
Concept Design Report		x				**Mandatory deliverable**
Detailed Design Report			x*	x	x	Mandatory deliverable *Draft accepted at this stage To summarise the detailed design activities, assumptions, clarifications and outcomes of the design to demonstrate compliance with relevant SA Water and Australian Standards. This document details the design changes and decisions between the CDR and the IFC design.
Design Management Plan		x*	x*			Mandatory deliverable as per TS0104 *Only applicable to SA Water Engineering for large project and to be completed prior to design commencing. Applicable to the Design Panel members and MFP Contractors for all Projects as per TS0104.
Technical Specification (AS4300 - ECI Contract)	x*					*Only applicable for major projects where a contractor is not already engaged under an existing agreement or sending out to multiple contractors for tender.
Technical Specification (AS4300 - D&C Contract)		x	x*			*This can be issued early in detailed design if it is agreed that design is developed further prior to pricing.
Technical Specification (AS2124 - Construct Only Contract)					x	
Engineering Specification (Regional Delivery Only)		x1, 2	x2	x2	x2	This document has two purposes: 1. It is used to convey scope, requirements and expectations to a Design Partner to undertake concept and detailed design. 2. It is used by the SA Water Engineering team to capture DBR, CDR and DDR requirements for low complexity outputs, which do not require stand alone documents to be developed.
Value Management Register	x	x				
Systems Engineering						
Needs Register	x					
Interface Register	x					
Assumptions & Constraints Register	x	x	x	x	x	To be updated throughout the project lifecycle by SAW. Not for contractors.
Key Decisions Register	x	x	x	x	x	To be updated throughout the project lifecycle by SAW. Not for contractors.
Operability Review	x					
Constructability Review	x					
Requirements Register	x					
V&V Register	x	x	x	x	x	Verification evidence due at each design phase, with design evidence 'closed out' at IFC.
Other Deliverables						

Investigations Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Site Investigations						
Site visits to inspect existing installation, gather required information etc.	x	x	x	x		Site visits as required to gather relevant information to enable the design to be developed and finalised. Sufficient site visit allowances shall be made, and RFI's requesting site based information that should have been gathered by the Contractor during site investigations may be rejected.
Topographical Survey			x	x	x	
Service location		x				
Site Bushfire Risk Assessment	x	x	x			To be conducted by qualified and experienced consultant to inform on the material selections for significant assets (plants, water storages etc) where disruption of services is not acceptable and / or sset loss is not acceptable due to high cost of reinstatement
Geotechnical Investigation - Desktop Study	x	x**				To be done at (or even before) 30%.
Geotechnical Investigation & Report		x**	x**	x	x	To be done at (or even before) 30% for complex structures. For ordinary structures at 60%
Environmental Investigations & Report		x**	x**	x	x	To be done at (or even before) 30% for complex structures. For ordinary structures at 60%
Condition Assessment Report			x	x	x	Defect maps to be developed showing deteriorated areas
Technical Memo - Existing Process (Site Investigation)	x					
Technical Memo - Process Technology Selection	x					
Technical Memo - Other Investigation	x					
Technical Memo - Pilot Plant Assessment	x					
Other Investigations						
Desktop site assessment from SAPPA maps	x					
Radio Path Survey (Physical)			x*	x*		*Timing of when this occurs will depend on the complexity of the project and the design impact it may have i.e. civil / structural impacts for tower / pole.
As-building of existing site drawings / documentation	x*	x*	x**			To enable detailed design activities to be undertaken, when existing site documentation is limited or cannot be relied upon and such information is need prior to the progression of detailed design. *Typically done for process/mechanical related works, to enable concept design. **Typically completed by the Designer for electrical related works, to enable detailed design.
Power Authority Investigations with SA Power Networks	x*	x*	x	x	x	*SAPN liaison is preliminary only at these stages i.e. to commence high level feasibility discussions only.
Other Deliverables						

Safety & Risk Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Safety in Design						**Safety in design is mandatory for all projects as per TS0101**
SID Assessment Plan	x	x				To be completed by SA Water where appropriate to allow for budgeting for Workshops etc
SID Short Form	x	x				For single discipline, low cost and low complexity projects. Not typically used for most capital projects executed through FEED. SID Specalist to approve the use of this Form.
HAZID Workshop & Minutes	x	x				
SID 1 Workshop & Register		x	x			Timing will be dependent on the scope and complexity of the project i.e. SiD 1 & 2 may be combined.
HAZOP Workshop, Register & Report		x	x	x		Workshop quantities and timing will be dependent on scope and complexity of the project i.e. Top Down vs Bottom Up
CHAZOP Workshop, Register & Report		x	x	x		Requirement for this process is driven by project complexity and risk. A CHAZOP should be carried out for chemical plants, critical systems and multi loop systems.
SID 2 Workshop & Register			x	x		Timing will be dependent on the scope and complexity of the project i.e. SiD 1 & 2 may be combined.
SiD Report				x	x	
Lessons Learned		x	x			Known hazards and incidents to be identified and integrated into the SiD process. Usually included in the Insight ribbon.
Other Safety / Hazard Studies						
AS4024 Risk Assessment Workshop, Register & Report		x	x	x		Required for machine guarding and emergency stop requirements
Pressure equipment hazard level classification				x	x	Required for pressure equipment such as surge vessels, accumulators, air compressor receivers etc
Functional Safety Lifecycle Process & Documentation (i.e. QRA, SRS etc.)		x	x	x		Requirement for this process is driven from the HAZOP / CHAZOP
Lifting Studies		x	x			
Shoring / Excavation Studies			x	x		
Ergonomic Studies			x	x		
Other Studies & Reports	x*	x*	x*	x*	x*	*As required by the specific project requirements.
General Risk Assessments						
Risk Register	x	x	x	x	x	
Multi-criteria Analysis	x	x				
General Risk Assessment Workshop & Report	x	x	x	x		Required where the above workshops are not suitable.
Hazardous Area Documentation						
Hazardous Area Classification Report			x	x	x	Multidiscipline - Lead by Process. This includes any required dispersion modelling, ventilation calculations etc.
Hazardous Area Classification Drawings			x	x	x	
Hazardous Area Design Report			x	x	x	To summarise the basis of the hazardous area design, assumptions, criteria, inputs etc. including specific requirements required by the standards i.e. glanding methodologies etc.
IS Loop / Entity Calculations			x	x	x	
Increased Safety Calculations (i.e. Te time, heat loading etc.)			x	x	x	
Hazardous Area Inspection Sheet Templates				x	x	Templates provided for review prior to construction phase services. Forms to be completed during the construction phase.
Hazardous Area Verification Dossier				x	x	Collation of all design information into the verification dossier. Dossier to be finalised during the construction phase.
Other Deliverables						

Multi-Disciplinary Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
General						
Control Philosophy		x	x	x	x	Developed in conjunction with the P&ID Multidiscipline activity: Process, Mech, EIC
Demolition Plan		x*	x	x	x	* Dependant of assessed risk
Drawings						
Red-line Markups of Existing Drawings	x*	x*				*Preliminary Only - Provided at early stages to show potential tie-ins to existing infrastructure.
Update of Existing Site Drawings			x	x	x	To be updated by the Designer, including superseding or making existing drawings obsolete.
Site plan	x	x	x	x	x	to include all disciplines, as required
General Arrangement/s	x	x	x	x	x	
P&ID (s)	x	x	x	x	x	Multidiscipline activity: Process, Mech, EIC
Demolition Drawings		x*	x	x	x	*If it needs to be provided, will be preliminary only
Security drawings		x	x	x	x	To be developed in consultation with the SA Water Security Team.
Fire systems drawings		x*	x	x	x	*If provided, is preliminary only
Construction Planning						
Cutover / Staging Plan		x*	x	x	x	*If provided, it will be preliminary only to highlight constraints / issues that need to be considered as a part of the design process.
Performance Testing Method / Criteria		x*	x	x	x	*If provided, it will be preliminary only to highlight constraints / issues that need to be considered as a part of the design process.
Construction Scope of Works				x	x	Typically for regional projects
Multi-disciplinary datasheets						
Building Datasheet/s or Technical Specification	x*	x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. Multi-discipline Activity Includes new switchroom buildings
Other Deliverables						

Civil & Structural Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Demolition Methodology - Notes			x	x	x	
Demolition Plans			x	x	x	
Demolition Elevations and Sections			x	x	x	
Civil/Structural - Other						
Buried Pipe Structural Integrity Calcs			x*	x*	x	*Dependant on assessed level of risk and if not covered by SA Water Water Supply Construction Standards.
Pipe Penetration Details		x*	x	x	x	Detailed Designs must be fully dimensioned *Basic details, as reqd
Pipe Trench Details (if non-standard)		x*	x	x	x	* Dependant of assessed risk
Other Deliverables						

Civil & Structural Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Drawings - Civil						
Civil Notes			x	x	x	
Site Plan	x*	x	x	x	x	*Preliminary Only
Pavement Plan			x	x	x	
Pavement Details		x*	x	x	x	*Basic details, as reqd
Drainage Plan			x	x	x	
Drainage Details		x	x	x	x	
Bulk Earthworks Plan			x	x	x	
Long Sections - Roads and Pipe			x	x	x	
Cross Sections - Roads and Pipes			x	x	x	
Service Trench - Details			x	x	x	
Earth Retaining structure - Plan & Details			x	x	x	
Drawings - Structural						
Structural Notes			x	x	x	
Thrust Block			x	x	x	Only if not covered by WSCM
Trench Cross Sections Drawings				x	x	with input from relevant discipline - elec, eg
Footings						
Concrete Plans with Members Schedule		x*	x	x	x	* Concept Design Plans can be provided without schedule
Reinforcement Plans with Reo Schedule			x	x	x	
Typical Footing Details		x*	x	x	x	*Basic details, as reqd
Ancillary Footing Sections and Details - for elec & mech equip.				x	x	which includes footing support and reinforcement support for other discipline related items such as switchboards, light poles, antenna, solar panel poles, pump,
Concrete						
Floor Plans with Members Schedule		x*	x	x	x	* Concept Design Plans can be provided without schedule
Reinforcement Plans with Reo Schedule			x	x	x	
Concrete Overall Elevations		x	x	x	x	
Concrete Overall Sections		x	x	x	x	
Typical Concrete Details		x*	x	x	x	*Basic details, as reqd
Project Specific Sections and Details				x	x	
Concrete Mix Design				x	x	
Defects Repair Methodology - Notes			x	x	x	
Defects Map		x	x	x	x	
Typical Concrete Repair Details			x	x	x	
Project Specific Repair Details				x	x	
Structural Steel (incl. alum and SS)						
Roof Framing Plans with Schedule		x*	x	x	x	* Concept Design Plans can be provided without schedule
Floor Framing Plans with Schedule		x*	x	x	x	* Concept Design Plans can be provided without schedule
Steel Framing Overall Elevations		x	x	x	x	
Steel Framing Overall Sections		x	x	x	x	
Typical Steelwork Details			x	x	x	
Project Specific Sections and Details				x	x	
Structural - General (Buildings Only)						
Building Floor Plans		x	x	x	x	
Building Roof Plans		x	x	x	x	
Building Overall Elevations and Sections		x	x	x	x	
Building Typical details		x*	x	x	x	*Basic details, as reqd
Projects Specific Sections & Details		x*		x	x	*Basic details, as reqd
Structural - Demolition						

Process Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Design/Calculations						
Process Calculations	x*	x	x	x	x	*Preliminary Only
Process OPEX Estimation	x*	x	x	x	x	*Preliminary Only
Mass Balance/Load	x*	x	x	x	x	*Preliminary Only
Filtration						
Filter Bed Sizing Calculations	x*	x	x	x	x	*Preliminary Only
Filter Media Hydraulic Calculations	x*	x	x	x	x	*Preliminary Only
Sedimentation Sizing Calculations	x*	x	x	x	x	*Preliminary Only
Reverse Osmosis Projections	x*	x	x	x	x	*Preliminary Only
Disinfection/Chemical Dosing Calculations						
Contact Tank Sizing	x	x	x	x	x	
Chemical Dosing Calculations	x	x	x	x	x	
Chemical Dosing Sizing	x	x	x	x	x	
Chemical Storage Sizing	x	x	x	x	x	
Chlorine Gas System Calculations	x	x	x	x	x	
Hypochlorite Dosing Calculations	x	x	x	x	x	
Odour						
OCU specification	x	x	x	x	x	
Extraction air volume required (extraction fan sizing)	x	x	x	x	x	
Media Volume and specification (organic v inorganic)	x	x	x	x	x	
Air Curtain v water seal requirement	x	x	x	x	x	
Modelling						
Water Modelling Calculations	x*	x	x	x	x	*Preliminary Only
Wastewater Treatment Modelling (BioWin etc)	x*	x	x	x	x	*Preliminary Only
Odour or Ventilation Modelling	x*	x	x	x	x	*Preliminary Only
Process Data Sheets						
Odour Control Units (ACF, BF, BTF) sizing	x*	x	x	x	x	Odour Tech Spec, *preliminary unit sizing only
Technical Data Sheets		x	x	x	x	
Drawings						
Process Flow Diagram	x	x	x	x	x	
Chemical Dosing Plant/Panel GA		x	x	x	x	TS 0127 - Liquid Chemical Dosing
Process and Instrumentation Diagrams	x*	x	x	x	x	*Preliminary Only
Other Deliverables						

Electrical & Instrument Control Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
LV Calculations and Modelling						
Arc Flash Modelling and Report (as per TS0371)			x	x	x	For Switchboards with a rating > 250A. The native file of the model is to be provided as a deliverable. If this cannot be accommodated, subject to approval from the Principal Electrical Engineer, then all relevant raw data utilised in the development of the model shall be provided to SA Water in a suitable format (i.e. spreadsheet) for future model development.
Control Power Supply and Battery Sizing Calculations (12VDC)			x	x	x	For RTU Applications, where 24VDC is not being utilised.
Control Power Supply and Battery Sizing Calculations (24VDC)			x	x	x	
Earth Fault Loop Impedance Calculations			x	x	x	Can be provided as a part of the LV Power Systems Model analysis, but evidence and commentary needs to be provided within the Detailed Design Report to demonstrate compliance with the standards.
Fault Level Calculations			x	x	x	Can be provided as a part of the LV Power Systems Model analysis, but evidence and commentary needs to be provided within the Detailed Design Report to demonstrate compliance with the standards.
Heat Loading Calculations (Panel, Switchboard etc.)			x	x	x	Indoor and Outdoor Panel Calculations
Harmonic Analysis & Report			x	x	x	The Report can be combined as a part of the Detailed Design Report.
Lighting Study			x	x	x	
Lightning Protection Risk Assessment (AS1768)			x	x	x	
Lightning Protection Study & Report			x	x	x	The Report can be combined as a part of the Detailed Design Report.
LV Cable Sizing Calculations			x	x	x	Can be provided as a part of the LV Power Systems Model analysis, but evidence and commentary needs to be provided within the Detailed Design Report to demonstrate compliance with the standards.
LV Power Systems Model (PowerCAD)		x*	x	x	x	*Concept phase is Preliminary only Native File of the model to be provided as a deliverable.
Maximum Demand Calculation/s		x*	x	x	x	*Preliminary calculation only. This is generally developed to assist with early engagement with SAPN, determine the suitability of existing supply systems to support the proposed new load, determine preliminary tie-in locations and provide context of the size of the new switchboard/MCC/DB. The Designer shall take responsibility for this calculation.
Protection, Coordination and Grading Study/s			x	x	x	Can be provided as a part of the LV Power Systems Model analysis, but evidence and commentary needs to be provided within the Detailed Design Report to demonstrate compliance with the standards.
Solar Panel and Battery Sizing Calculations		x*	x	x	x	*Preliminary only, if provided. The Designer shall be responsible for this calculation. Typically provided for RTU applications.
Surge Divertor Sizing Calculation/s			x	x	x	
UPS and Battery Sizing Calculations		x*	x	x	x	*Preliminary only, if provided. The Designer shall be responsible for this calculation.
HV Calculations / Modelling						
HV Power Systems Modelling and Report			x	x	x	Coordination with the relevant Supply Authority will be required to source relevant design inputs i.e. fault levels, impedance values etc. The native files of all model shall be provided as a deliverable. If this cannot be accommodated, subject to approval from the Principal Electrical Engineer, then all relevant raw data utilised in the development of the model shall be provided to SA Water in a suitable format (i.e. spreadsheet) for future model development. All reports shall summarise the scope, assumptions, options considered, issues encountered, findings, recommendations and confirmation that the design documented complies with relevant standard requirements.
HV Fault Analysis and Low Flow Study and Report			x	x	x	Refer comment above.
HV Protection Study and Report			x	x	x	Refer comment above.
HV Earthing Study and Report			x	x	x	Refer comment above.
Arc Flash Modelling and Report (as per TS0371)			x	x	x	Refer comment above.
HV Cable Sizing Calculations			x	x	x	Refer comment above.
LFI/ERP Investigation and Report			x	x	x	Multi-discipline Activity with inputs required from the Mechanical Designer
Drawings						
Single Line Diagram/s		x*	x	x	x	*Preliminary Only For HV, this includes protection single line diagrams as well.
Power Distribution Diagrams			x	x	x	
Electrical Schematic Diagrams			x	x	x	To include main incomer(s), generator incomer, motor, fan, heater, lighting, valving, etc.

Electrical & Instrument Control Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Control Power Distribution Diagram/s			x	x	x	
Control Power Single Line Diagram/s			x	x	x	
Control Schematic Diagrams			x	x	x	To include power supply, battery, UPS etc.
Distribution Board Control Schematics			x	x	x	For external lighting control for instances.
PLC I/O Diagrams			x	x	x	To include AI, AO, DI, DO, Communications and any other required drawings
RTU I/O Diagrams			x	x	x	To include AI, AO, DI, DO, Communications and any other required drawings
RTU Power Distribution Diagram/s			x	x	x	
Network Architecture / Topology Diagram		x*	x	x	x	*Preliminary Only
Junction Box / Marshalling Panel / Remote Switching Panel Termination Diagrams				x	x	
Instrumentation Loop Diagram/s				x	x	
Instrumentation Mounting Diagram/s				x	x	
Equipment Layout Diagram/s		x	x	x	x	This is to include site layouts, switchroom and/or building layout drawings, lighting and power layouts etc. in order to highlight the location and size of new equipment items
Equipment Mounting Details		x		x	x	To provide context of where / how new equipment items are to be mounted.
General Arrangement Diagrams			x	x	x	This is to include Switchboard, MCC, DB, Control Panel, PLC Panel, Radio Panel, RTU Panel, Junction Box, Marshalling Panel etc. This includes Plan, Elevation, Section, Doors On / Off, Escutcheon View (Infront / Behind) etc.
Cable Routing Diagram/s			x	x	x	
Earthing Details				x	x	Typical earthing connection details
Earthing Layout Diagram/s			x	x	x	To define earth grid / stake details
Earthing Schematic/s, block diagram/s				x	x	To detail earthing field connections
Lightning Protection System Details				x	x	Typical earthing connection details
Lightning Protection System Layout Diagram/s			x	x	x	To define earth grid / stake details
Package Drawing List Coversheet			x	x	x	
Drawing Convention & Wiring Standards Sheet				x	x	
Bill of Materials List/s				x	x	
Cable Schedule/s			x	x	x	SA Water Cable Schedule Template to be utilised
Distribution Board Circuit Schedule/s			x	x	x	
Equipment Schedule/s				x	x	Summarises equipment supplier, make, model and key rating data for all equipment items
Instrumentation Schedule/s				x	x	Summarises equipment supplier, make, model and key rating data for all instrumentation
Label Schedule				x	x	
Control and SCADA Documentation						
SCADA Impact Assessment	x	x*				*Typically to be completed by SA Water
Functional Design Specification				x	x	
PLC I/O Schedule		x*	x	x	x	*Preliminary Only
RTU I/O Schedule		x*	x	x	x	*Preliminary Only
SCADA Screens/Tags Markups				x	x	
Electrical Equipment data sheets						
HV Switchboard Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Ring Main Unit Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Kiosk Substation Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. This is a combined RMU, Transformer, LV Distribution and Enclosure Datasheet
Transformer Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Generator Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. Multi-discipline Activity
AS61439 LV Switchboard Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. User requirements datasheet. Datasheet to be completed by the Designer in consultation with the board manufacturer.
AS61439 MCC Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. User requirements datasheet. Datasheet to be completed by the Designer in consultation with the board manufacturer.

Electrical & Instrument Control Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
AS61439 DB Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. User requirements datasheet. Datasheet to be completed by the Designer in consultation with the board manufacturer.
AS61439 Control Panel Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. User requirements datasheet. Datasheet to be completed by the Designer in consultation with the board manufacturer.
UPS Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Variable Speed Drive Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Harmonic Mitigation Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Soft Starter Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Motor Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. Multi-discipline Activity
Solar Panel and Inverter Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Battery Charger and Battery Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Other Datasheet/s		x	x	x	x	As required by the specific project requirements.
Control and Communications Equipment data sheets						
PLC Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
HMI Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. Includes eHMI
RTU Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Radio / 4G Modem Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Other Datasheet/s		x	x	x	x	As required by the specific project requirements.
Instrumentation data sheets						
Analyser Datasheet/s		x	x	x	x	Multi-discipline Activity
Flowmeter / Flow Switch Datasheet/s		x	x	x	x	Multi-discipline Activity
Gas Detector Datasheet/s		x	x	x	x	Multi-discipline Activity
Level Transmitter / Level Switch Datasheet/s		x	x	x	x	Multi-discipline Activity
Pressure Transmitter / Pressure Switch Datasheet/s		x	x	x	x	Multi-discipline Activity
Limit Switch Datasheet/s		x	x	x	x	Multi-discipline Activity
Other Datasheet/s		x	x	x	x	As required by the specific project requirements.
Other Deliverables						

Materials Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Test Results						**Deliverable in construction Phase**
Concrete Mix Design and test results					x*	x*: This is what to be considered in construction stage.
Failure Investigations						**Deliverable as investigation report**
Materials failure analysis	x*	x*				x*: This activity to be done (if required) in one of these stages, ideally during investigation stage
Other Deliverables						

Materials Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Welding						
Welding requirements			x	x	x	Deliverable in construction Phase. Welding requirement needs to have at least 60% design to make sure about materials and construction process.
Cathodic Protection						
Cathodic protection, review of exisiting CP	x	x				
Cathodic protection design site investigations including soil resisitvity testing		x	x	x	x	Note that these investigations require time, and need to be followed by a desing process. Start as early as possible once it has been confirmed that MSCL pipe will be used and that CP will be provided.
Cathodic protection, design (new, retrofit)			x	x	x	
Cathodic protection, electrolysis and stray current mitigation considerations	x	x	x	x	x	Consider as early as possible. Can be delted from subsequent stages, once completed.
LFI/EPR studies on pipelines	x*	x	x	x	x	Consider that these studies take several weeks to months to completed depending on how quickly inputs are obtained from relevant authorities/utilities. *Dependent on project risk
Durability Planning						
Durability planning, report/assessment		x	x	x	x	Mandatory for more complex projects proposed is Risk levels 1 and 2
Corrosivity assessment, macro and micro environments		x	x	x	x	
For material selection refer to items below		x	x	x	x	
Site Investigations						
Corrosion condition Assessment of metallic structures - site visit and inspection	x*	x*				*This activity to be done (if required) in one of the stages, ideally during Planning & Scoping or 30% Concept.
Concrete deterioration/corrosion sssessment of concrete structures - site visit and inspection	x*	x*				*This activity to be done (if required) in one of the stages, ideally during Planning & Scoping or 30% Concept.
Materials sampling and testing - concrete, steel, polymers	x*	x*				*This activity to be done (if required) in one of the stages, ideally during Planning & Scoping or 30% Concept.
Condition and remaining life assessment						
Condition Assessment - report	x*	x*				*This activity to be done (if required) in one of the stages, ideally during Planning & Scoping or 30% Concept.
Remaining life assessment, structural assets	x*	x*				*This activity to be done (if required) in one of the stages, ideally during Planning & Scoping or 30% Concept.
Remaining life modelling (Chloride, carbonation)	x*	x*				*This activity to be done (if required) in one of the stages, ideally during Planning & Scoping or 30% Concept.
Materials Selection						
Material selection - repair and rehabilitation (concrete, metallic, polymers and coating)	x*	x	x	x	x	*Should be included here if there are fixed predetermined requirements, which are impacting cost
Material selection - new construction (coatings)	x*	x	x	x	x	*Should be included here if there are fixed predetermined requirements, which are impacting cost
Concrete	x*	x	x	x	x	*Should be included here if there are fixed predetermined requirements, which are impacting cost
Metals and alloys	x*	x	x	x	x	*Should be included here if there are fixed predetermined requirements, which are impacting cost
Polymers	x*	x	x	x	x	*Should be included here if there are fixed predetermined requirements, which are impacting cost
Material Notes on drawings (material properties + durability notes)		x	x	x	x	
Specifications						
Coatings			x	x	x	
Linings			x	x	x	
Hot dip galvanised coatings			x	x	x	
coating specification for organic coatings			x	x	x	
coating specification for thermal spray coatings			x	x	x	
Materials for corrosion resistance			x	x	x	

Mechanical & Hydraulics Deliverables

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Design/Calculations/Modelling						
Steady State Hydraulic Modelling Report	x	x	x	x	x	
Surge Modelling Report		x*	x	x	x	*Dependant on assessed level of risk. May be combined with steady state into overall hydraulics report
Water Balance	x*	x*	x*	x*	x*	*Dependant on assessed level of risk and applicability.
Hydraulic calculations - Hydraulic Grade Lines		x	x	x	x	Input from Process team and Water Quality where required. May be included in hydraulic report.
Hydraulic calculations - System curves		x	x	x	x	Applicable to valves and pump selection. Pump/valve curves must be overlayed over System Curves. May be included in hydraulic report.
Hydraulic calculations - NPSHa		x*	x	x	x	Requirement at concept design stage dependent on assessment of risk.
Materials Selection Report			x	x	x	Can be part of DBR for simple projects
Pipe resonance calcs			x	x	x	
Plant/Machinery Vibration Calcs		x*	x	x	x	*Dependant on assessed level of risk
Hydraulic Residence Times Calcs (Sewer networks) Report		x	x	x	x	Can be part of CDR at Concept Stage
Air Conditioner Sizing Calculations		x	x	x	x	If required for a new buildings, switchrooms, control rooms or if typical ventilation fans cannot provide adequate cooling. Multidiscipline Activity.
Ventilation fan sizing calculations		x	x	x	x	Building ventilation
Piping stress analysis			x	x	x	
Anchor force calculations			x	x	x	To be used as an input to structural design of pipe anchors.
Pressure vessel risk assessment						
Surge vessel sizing and hydraulic calculations						May be included in hydraulic report.
Pipe thickness calculations						May be included in piping stress analysis.
Weld strength/size calculations						
Branch reinforcement calculations						
Flange gasket and bolt stress calculations				x	x	For bolted flange joints with flanges on pipes that are not standard sizes (ISO 559 for steel pipe) or for flange joints with flanges of differing dimensional standards.
Drawings						
Pipeline alignment plans		x	x	x	x	
Pipeline longitudinal sections		x	x	x	x	Long sections if the pipeline is >500m or if pipe profile is important in understanding hydraulics and/or pipeline operation
Hydraulic Grade Lines		x	x	x	x	
System curves		x	x	x	x	For network, distribution and transmission water pumping systems and for wastewater pumping systems.
Piping arrangement plan and sections		x	x	x	x	Piping arrangement drawings required if piping arrangement not covered adequately in the general arrangement drawings.
Piping details		x*	x	x	x	*Basic details
HVAC arrangement		x	x	x	x	Arrangement of key equipment (eg location of fans, air intakes, air exhausts, ducting, condenser units, fan coil units.
HVAC details				x	x	Refrigerant and condensate piping runs, ducting details, pipe/ducting supports, lagging, attennuation, insulation, louvres, motorised dampers, fans, filters, cowls, guards etc
Piping arrangement drawing		x	x	x	x	With input from Process if needed, with the ownership from the biggest input
Mechanical Equipment data sheets						
Pump Datasheet/s	x*	x	x	x	x	*If asset is identified for early procurement
Control Valve Datasheet/s		x	x	x	x	
Large/critical/non-standard isolating valve datasheet/s	x*	x	x	x	x	As required by the specific project requirements. *If asset is identified for early procurement
Large/critical non-return valve datasheet/s	x*	x	x	x	x	*If asset is identified for early procurement
Actuator datasheet		x	x	x	x	Incorporate with valve datasheet when specifying together with a valve.
Other Deliverables						

Appendix D – Non-conformance form

The TS 0104 Non-conformance Form may be used to initiate the non-conformance process described in Section 7.2 where a non-conformance with this Technical Standard is identified.

The form is completed through the SA Water Engineering AquaNet site. Submission initiates the SA Water non-conformance process but does not replace the Consultant's non-conformance process under its Quality Management System.

- **Document:** SAWF-ENG-0104-01 – Non-conformance Form
- **Purpose:** Records an identified non-conformance and initiates the TS 0104 non-conformance management process.
- **Controlled source:** SA Water Engineering AquaNet (via Nintex form)
- **Referenced in:** Section 7.2

Always use the current controlled form available from the nominated source.

Appendix E – Issue escalation form

The TS 0104 Issue Escalation Form shall be used where a technical or scope-related issue requires escalation for resolution in accordance with Section 6.2.11.

The form provides a consistent basis for documenting the issue, relevant background, available options and their implications, and the information required to support an escalation decision.

- **Document:** SAWF-ENG-0104-02 – Issue Escalation Form
- **Purpose:** Documents a technical or scope-related issue requiring escalation and provides the information necessary to support its resolution.
- **Controlled source:** SA Water Technical Standards webpage
- **Referenced in:** Section 6.2.11

Always use the current controlled version available from the SA Water Technical Standards webpage.

Appendix F – Design milestone acceptance certificate

The Design Milestone Acceptance Certificate (DMAC) shall be used to obtain and record SA Water's formal acceptance of final design deliverables in accordance with Section 6.2.10.

The DMAC identifies the final design deliverables submitted for Design Milestone Acceptance and records the applicable acceptance decision. The Deliverables worksheet forms part of the DMAC and identifies the final design deliverables covered by the acceptance.

- **Document:** SAWF-ENG-0104-03 – Design Milestone Acceptance Certificate
- **Purpose:** Identifies the final design deliverables submitted for Design Milestone Acceptance and records SA Water's acceptance of the design package.
- **Controlled source:** SA Water Technical Standards webpage
- **Referenced in:** Section 6.2.10

Always use the current controlled version available from the SA Water Technical Standards webpage.

Appendix G – Equipment Procurement Exception Form

The Equipment Procurement Exception Form (EPEF) shall be used where equipment procurement is required before the design is fully developed, or where Design Milestone Acceptance is sought before final equipment selection, in accordance with Section 6.2.13.

The EPEF provides the documented basis for managing the exception, including the applicable assumptions, risks and controls, and subsequent confirmation of the final equipment information.

- **Document:** SAWF-ENG-0104-04 – Equipment Procurement Exception Form
- **Purpose:** Records and controls an approved exception associated with equipment procurement or final equipment selection and provides for subsequent confirmation of the selected equipment against the accepted design basis.
- **Controlled source:** SA Water Technical Standards webpage
- **Referenced in:** Section 6.2.13

Always use the current controlled version available from the SA Water Technical Standards webpage.