Engineering

Technical Standard

TS 0109 – Infrastructure Design

Version: 1.0

Date: 10 March 2023

Status: Final

Document ID: SAWS-ENG-0109

Government of South Australia

Copyright

Application & Interpretation of this Document

It is the responsibility of the users of this Standard to ensure that the application of information is appropriate and that any designs based on this Standard are fit for SA Water's purposes and comply with all relevant Australian Standards, Acts and regulations.

Users of this Standard accept sole responsibility for interpretation and use of the information contained in this Standard. Users should independently verify the accuracy, fitness for purpose and application of information contained in this Standard.

Only the current revision of this Standard should be used which is available for download from the SA Water website.

Significant/Major Changes Incorporated in This Edition

This is the first issue of this Technical Standard.

However, the requirements of this Standard regarding minimum Design Life and Service Life for SA Water's infrastructure are consolidated into this document and shall take precedence over requirements of all other SA Water Technical Standards, specifications and similar documents that seek to specify minimum design life for assets and their components, whether that be for new or rehabilitated infrastructure.

Document Controls

Revision History

Revision	Date	Author	Comments
1.0	10/03/23	Matthew Davis	First issue

Template: Technical Standard Version 6.00, 10/05/2016

Approvers

Role	Signature and Date
Manager Integrated Water Management Dan Falzon	21/03/2023 X Daniel Falzon Signer's Name Signed by: FA004588
Manager Engineering Quality and Innovation Matthew Davis	17/03/2023 X  Signer's Name Signed by: DA003681
Senior Manager Engineering Services Richard Gray	21/03/2023 X  Signer's Name Signed by: GR001964

Reviewers

Role	Name	Revision	Review Date
Principal Engineer, Electrical	Justin Hamra	1.0	15/02/2023
Principal Engineer, Mechanical & Hydraulic	Gordon Holmes	1.0	15/02/2023
Lead Asset Planner – Water	Michael Nicholas	1.0	21/02/2023
Principal Engineer, Dams & Geotechnical (Acting)	Nick Wenzel	1.0	23/02/2023
Environment & Liveability Specialist	Alex Czura	1.0	06/03/2023
Senior Materials Engineer	Alex Kyriakopoulos	1.0	07/03/2023
Principal Engineer, Materials Science	Ramon Salazar-Romero	1.0	10/03/2023
Principal Engineer, Civil & Structural	Hany Habib	1.0	10/03/2023

Contents

List of Figures

List of Tables

1 Introduction

SA Water is responsible for the construction and commissioning of an extensive amount of engineering infrastructure such that it is safe and fit for purpose.

As part of managing this infrastructure, providing clear and concise information regarding the Design Life expected is important to ensuring that the business derives the intended value from investments made in its infrastructure to maintain continuity of service to the community.

1.1 Purpose

The purpose of this standard is to define how design events, along with minimum Design and Service Life requirements are determined for SA Water infrastructure, to establish consistency in design and detailing. This is to ensure SA Water infrastructure is being constructed and commissioned to achieve a similar level of service and performance across South Australia.

The requirements established in this Standard have been based on criticality and durability principles (the latter presented in greater detail in TS 0110), as well as drawing on SA Water's experience managing its infrastructure.

1.2 Glossary

The following glossary items are used in this document:

Term	Description
ABS	Acrylonitrile Butadiene Styrene
AS/NZS	Australian Standard/New Zealand Standard
CP	Cathodic Protection
CA	Corrosion Allowance
EBS	Earth Bank Storage
EPDM	Ethylene-propylene-diene-monomer
FRP	Fibre Reinforced Plastic
GRP	Glass Reinforced Plastic
HDPE	High-Density Polyethylene
HMI	Human Machine Interface
HVAC	Heating, Ventilation and Air Conditioning
ISO	International Organisation for Standardisation
NCC	National Construction Code
NERAG	National Emergency Risk Assessment Guidelines
NPV	Net Present Value
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substances
PLC	Programmable Logic Controller
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete Pipe
RCP4.5/RCP8.5	Representative Concentration Pathways
SA Water	South Australian Water Corporation
SCADA	Supervisory Control and Data Acquisition
TCE	Trichloroethene
TG	SA Water Technical Guideline
TS	SA Water Technical Standard
UV	Ultraviolet
VSD/VFD	Variable Speed Drive/Variable Frequency Drive
WSA	Water Services Association

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:

Number	Title
	Department for Environment and Water (2022). *Guide to Climate Projections for Risk Assessment and Planning in South Australia 2022* Government of South Australia, through the Department for Environment and Water, Adelaide.
	National Construction Code, Building Code of Australia
AS/NZS 1170.0	Structural design actions Part 0: General principles
AS/NZS 1170.2	Wind Actions
AS/NZS 1170.4	Earthquake Loads
AS 1210	Pressure vessels
AS 2312.1	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Paint coatings
AS 2312.2	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Hot dip galvanizing
AS 2124	General Conditions of Contract
AS 3600	Concrete
AS 4300	General conditions of contract for design and construct
AS 4312	Atmospheric corrosivity zones in Australia
AS 5100.5	Concrete
ISO 13823	General principles on the design of structures for durability
WSA201	Manual for selection and application of protective coatings

1.3.2 SA Water Documents

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

Number	Title
TS 15	Protection of Steelwork in Immersed Conditions
TS 16	Protection of Steelwork in Atmospheric Environments
TS 18	Protection of Buried Pipework
TS 55	The Supply of 305 mm Diameter Welded Steel Vent Tubes
TS 0101	Safety in Design
TS 0110	Durability (when published)
TS 0136	Third Party Works Near SA Water Pipework
TS 147	Surge Mitigating Infrastructure
TS 0230	Gate and Butterfly Valve Requirements
TS 0260	Requirements for Flow Meters
TS 0440	Cathodic Protection Part 1 - Pipelines
TS 0460	Liners and Floating Covers for Earth Bank Storages for Potable or Recycled Water
TS 0500	Authorised Products for Maintenance of Water & Sewer Systems
TS 0502	Authorised Products for Gravity Sewer and Pressure Pumping Main
TS 0503	Authorised Products for Water Systems
TS 0504	Authorised Products for Packaged Sewer Pumping Stations
TS 0506	Authorised Products for Vacuum Sewer Systems
TS 0507	Authorised Products for Pressure Sewer Systems
TS 0521	Raising and Lowering Access Covers
TS 0522	Allowable Pipe Size, Class and Materials for Reticulation Water Mains
TS 0601	Design, Assessment and Retrofitting of SA Water Assets in Bushfire-Prone Areas
TS 0710	Concrete
TS 0720	Access Infrastructure for Tanks
TS 0721	Design Requirements for Water Storage Tanks and Associated Works (when published)
TS 0800	Materials in Contact with Drinking Water

1.4 Definitions

The following definitions are applicable to this document:

Term	Description
Component	Any part of the structure or non-structural part or mechanical/electrical components that may affect the durability of the structure.
Constructor	The organisation responsible for constructing and installing infrastructure for SA Water whether it be a third party under contract to SA Water or an in-house entity.
Design Life	The **specified/assumed period** of time for which infrastructure (or its constituent components) is expected to be used for its intended purpose, and under the expected conditions, without major repair or replacement being necessary
Designer	The organisation responsible for designing infrastructure for SA Water whether it be a third party under contract to SA Water, a Constructor, or an in-house entity
Durability	Capability of a structure or any component to satisfy, with planned maintenance, the design performance requirements over a specified period of time under influence of environmental actions, or as a result of self-aging. Reference shall be made to TS 0110 for more information.
Facility Design Life	The Design Life of an entire facility (for example, a Water Treatment Plant, Wastewater Pump Station etc.)
Maintenance	A combination of all technical and associated administrative actions during infrastructure (or its constituent components) Service Life with the aim of retaining it in a state in which it can perform its required functions.
Major Pipeline	Refer TS 0136 for definition
Prolonged Service Life	The period comprising of both the Design Life and Residual Life.
Rehabilitation	Restoring a structure (or part thereof) to its original or required level of service by undertaking repairs or modifications that are remedial in nature, and which are less frequent than maintenance activity.
Repair	The restoration of a structure or components to an acceptable condition by the renewal or replacement of worn, damaged or deteriorated components. Repair activities normally fall outside the scope of maintenance activities.
Residual Life	The period of time for which an asset shall remain operational and serviceable after reaching its Design Life.
SA Water's Representative	The SA Water representative with delegated authority under a Contract or engagement, including (as applicable): • Superintendent's Representative (e.g., AS 4300 and AS 2124, etc.) • SA Water Project Manager • SA Water nominated contact person
Service Life	The **actual period** during which infrastructure (or its constituent components) satisfy the design performance requirements without unforeseen major repair or maintenance, when used for its intended purpose and under the expected conditions of use
TDRF	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, prior to construction.
Trunk Main	Refer TS 0136 for definition

2 Scope

The scope of this Technical Standard is to:

a) Describe the design process for SA Water infrastructure, with respect to determining parameters used to establish the design event/s, infrastructure criticality and design life.

b) Present general principles of applying Design and Service Life and

c) Provide default Design/Service Life values for typical SA Water infrastructure to guide decision for both project and asset management activities.

2.1 Exclusions

This Standard is not intended to:

a) Define the Facility Design Life.

b) Provide comment on long term plans at a given facility/site where a project is being undertaken, which may warrant a Design or Service Life which differs from those presented in Section 6.

c) Define aspects associated with asset depreciation.

d) Define Design Life values for infrastructure with Dam Safety implications.

  - o Special strength and durability design considerations, tailored to an individual site, are required to achieve Design Life, and satisfy ANCOLD guidelines. Such considerations are over and above typical Australian Standards requirements and are beyond the scope of this Standard.

e) Define Design Life values for infrastructure or components that are temporary in nature (e.g., enabling works to facilitate construction etc.)

  - o However, infrastructure (or its constituent components) that can be dismantled with a view to being re-used are within scope.

Points a) to c) above represent strategic decisions to be taken within an asset management and project context, having regard for future works/modifications/upgrades, historical performance or replacement/decommissioning projections. This Standard is not intended to cover such nuances, rather, it provides a generalised default position of SA Water's Design and Service Life expectations to support the effective design and management of infrastructure.

3 Approach to Design

3.1.1 Design Requirements

Infrastructure shall be designed and constructed in such a way that it will, during its Design Life, and with appropriate degrees of safety and reliability, sustain all actions and environmental influences likely to occur (including cyclic fatigue).

It shall be designed to withstand extreme or frequently repeated actions (or both), occurring during its construction and anticipated use, including but not limited to:

- Earthquake design events: Refer AS 1170.4, Earthquake loads.
- Wind design events: Refer AS/NZS 1170.2, Wind actions.
- Bushfire design events: Refer TS 0601, Design, Assessment and Retrofitting of SA Water Assets in Bushfire-Prone Areas.

All infrastructure in contact with drinking water shall comply with the requirements of TS 0800.

3.1.2 Establishing the Design Event

The design event may be determined as follows:

Step 1: Identify if Infrastructure is Critical or Non-critical (Section 4).

Step 2: Assess the Facility Design Life and its implications on the Design Life of constituent infrastructure or components (as required) (Section 5).

Step 3: Determine the required Design Life of infrastructure and its components (Section 6).

- Deviations from the default requirements presented in this Technical Standard are to be managed as described in Section 6.3
- Environmental considerations shall also be incorporated, per Section 3.1.5, as applicable.

Step 4: Based on preceding steps, determine importance level, the annual probability of exceedance, and progress with the design based on the selected design event (this Section).

- Other design considerations (such as impacts of climate change, provisions for inspection/maintenance activities etc.) are to be included in the design process, per Section 6.2.1.

3.1.3 Importance Levels

Importance level shall be determined in accordance with AS1170.0, Table F1, with a consequence of failure assessment (whether total or partial failure) to be conducted during the initial project development stages. This assessment, together with infrastructure criticality and design life, will inform design requirements for each design event. It is expected that importance level will be determined by the project team, led by the project sponsor, and be incorporated into the project-specific documentation during the preliminary design phases.

- As well as the impact of infrastructure failure in its immediate vicinity, the consequence assessment shall also consider the function of infrastructure within the context of SA Water's network and/or facility.

3.1.4 Design Events

The requirements of this section are drawn from AS/NZS1170.0, but have been tailored to SA Water's specific circumstances, to map critical and non-critical infrastructure against the Importance Levels defined in AS/NZS 1170.0, Table F1.

For bushfire design events, reference shall be made to Table GV5.1 of the National Construction Code (NCC).

The annual probability of exceedance depends on the infrastructure criticality and the design working life of the structure. Once these are determined, design events (in terms of annual probability of exceedance) shall be as provided in Table 1, which shall be used in place of AS1170.0, Table F2.

Table 1 - Design Events

Design Life *(see Note 3)*	**Infrastructure Criticality**	**Importance Level** *(see Notes 1,2)*	**Design events for safety in terms of annual probability of exceedance**	
			Wind	**Earthquake**
5 years or less *(only for structures whose failure presents no risk to human life)*	Non-critical	1 2	1/25 1/50	Not required *(see Note 3)*
	Critical	3	1/100	
25 years	Non-critical	1 2	1/100 1/200	Not required *(see Note 3)* 1/250
	Critical	3 4	1/500 1/1000	1/500 1/1000
50 years	Non-critical	1 2	1/100 1/500	1/250 1/500
	Critical	3 4	1/1000 1/2500	1/1000 1/2500
100 years or more	Non-critical	1 2	1/500 1/1000	1/250 1/1000
	Critical	3 4	1/2500 Refer Section 3.1.4.1	1/2500 Refer Section 3.1.4.1

Notes:

1) *Importance Level 5 structures present a substantial risk to SA Water, and reliability and design events must be set on a case-by-case basis.*
2) *Critical infrastructure shall not have an importance level less than 3.*
3) *For Design Lives (L) between 5 and 100 years that are not listed in Table 1, the annual probability of exceedance (1/R) for wind and earthquake events is calculated as r/L, where the lifetime risk (r) is given in Table 2:*

Table 2 - Lifetime Risk

Importance Level	***Risk of exceedance of design load (r)***
1	*0.20 to 0.25*
2	*0.10 to 0.125*
3	*0.04 to 0.05*
4	*0.02 to 0.025*

4) *Earthquake loads for these annual probabilities are low and design for robustness or other actions will provide sufficient resistance.*

3.1.4.1 Minimum Design Thresholds

Infrastructure whose failure might result in loss of human life shall not be designed for less than a 25-year Design Life.

Infrastructure with an Importance Level of 4 shall not be designed for less than a 25-year Design Life, unless explicitly noted as such in Tables 3 to 11 (e.g., electrical components). For infrastructure with an Importance Level of 4 and a Design Life of 100 years or more, the design events shall be determined by a risk analysis but shall have probabilities less than or equal to those for Importance Level 3.

3.1.5 Sustainability Considerations

3.1.5.1 Impact of Climate Change

South Australia's climate is changing, with increases in average temperatures, greater frequency of very hot days, declining rainfall and rising sea levels already being observed. New climate projections indicate these changes will continue over coming decades, increasingly affecting communities, industries, infrastructure, and the environment in every part of the state which will require every sector of society to adapt.

The Department for Environment and Water has published a *Guide to Climate Projections for Risk Assessment and Planning in South Australia 2022*, which provides a summary of the likely changes to key climate variables, such as temperature, rainfall, evapotranspiration, days of severe fire danger and sea level rise, under different greenhouse gas emissions scenarios. The document draws on the most up-to-date climate change projections for South Australia and can be used for climate change risk assessment, adaptation planning and community engagement.

The application of the scenarios contained within the guide to the design of SA Water infrastructure (including rehabilitations) shall be as follows:

- For Design Lives that extend up to the year 2050
    - Use applicable data associated with the RCP8.5 emission scenario.
- For Design Lives extending beyond the year 2050
    - For critical infrastructure, use applicable data associated with the RCP8.5 emission scenario.
    - For non-critical infrastructure, use applicable data associated with the RCP4.5 emission scenario.

This approach is consistent with that presented by the Department for Water and Environment in considering the uncertainty in future emissions trajectories, the sensitivity of global temperature to greenhouse gas concentrations and the need to balance the significant differences in future climate (especially beyond 2050) with the risk and cost impacts that they pose to SA Water's infrastructure and customers.

3.1.5.2 Design for Flooding

SA Water has substantial and critical infrastructure located in the Murray River floodplain which, with climate change impacting the severity and magnitude of extreme weather events, is likely to come under increasing threat of significant flood events, when they occur.

To mitigate the impacts of such events on SA Water operations and business continuity, designs for critical infrastructure shall accommodate the 1956 flood level, plus an additional 600mm of freeboard.

3.1.5.3 Sustainable Design

Sustainable infrastructure is planned, designed, constructed, operated and decommissioned in a manner that ensures economic, social, environmental (including climate resilience), and institutional sustainability over the entire infrastructure life cycle.

Infrastructure shall be designed to support the achievement of the following designed related sustainability objectives including:

- Minimising the generation of greenhouse gases across the full asset lifecycle.
- Minimising material lifecycle impacts across the full asset lifecycle.
- Designing with a whole of life view that minimises future maintenance, repair, and/or replacement, considering climate resilience and future climate change impacts described in Section 3.1.5.

The use of materials and products that contain recycled content is also encouraged, to support the objectives of SA Water's Environment Corporate Strategy and South Australia's Waste Strategy. While their use is subject to required performance specifications being satisfied (e.g., an Australian Standard, Water Services Association Product Specification etc.), many products with recycled content can meet the durability, design life and service life requirements seen in products made solely from virgin materials.

4 Infrastructure Criticality

4.1.1 Introduction

The criticality of infrastructure is related to the consequences of failure, and for SA Water infrastructure is based on the National Emergency Risk Assessment Guidelines (NERAG) (2020).

NERAG is a document that has been prepared by the Australian Institute for Disaster Resilience and provides a national approach to the risk assessment consistent with AS/NZS ISO 31000 (2018) "Risk Management – principles and guidelines".

There are numerous risk categories detailed within the NERAG. In its application in this Technical Standard, it has been adjusted to reflect the functions of SA Water infrastructure and their impact on customers and level of service.

4.1.2 Definition

SA Water defines its infrastructure as being critical or non-critical, to reflect the importance of a given asset to SA Water, and the impacts a partial or total loss of functionality will have on business, customer, and operational outcomes. In doing so, the aim is to ensure that consequences arising from a loss of functionality are mitigated by implementing appropriate measures during the infrastructure design process.

4.1.3 Application

At SA Water, infrastructure criticality is used as:

a) A design tool to support the application of Importance Levels in AS1170.0, based on which design events (in terms of annual probability of exceedance), combined with design life, are selected and

b) A risk-assessment tool to prioritise strategic and routine asset management and planning activities, based on consequential outcomes.

Infrastructure criticality does not consider probability or likelihood (that is, if and/or when), and thus should not be treated as a risk rating. Rather, it represents the consequences of partial or total loss of functionality.

4.1.4 Determination of Infrastructure Criticality

Ideally, infrastructure criticality would be evaluated and made available prior to the commencement of any infrastructure project. However, it is recognised that this will not always be the case, and that some projects will commence without this information being available. Where this occurs, infrastructure criticality shall be determined via the same process described in Section 3.1.3.

5 Application of Design and Service Life

5.1 Design Life

SA Water's definition of Design Life is derived from ISO 13823 but tailored to suit the range of infrastructure and constituent components for which SA Water is responsible. It is defined as "the **specified/assumed period** of time for which infrastructure (or its constituent components) is expected to be used for its intended purpose, and under the expected conditions, without major repair or replacement being necessary."

Before this period has elapsed, infrastructure shall remain fit for purpose. There is an expectation that regular condition assessment and maintenance will be conducted throughout the specified Design Life for accessible assets or components. Designers shall ensure that components are designed with the principles of designing for durability suitably accommodated (including documentation of inspection, maintenance, and condition requirements).

Adoption of a nominated Design Life for infrastructure does not mean that it will no longer be fit for service when it reaches that age. SA Water's expectation is that upon reaching its nominated Design Life, infrastructure shall remain operational and serviceable (referred to as Residual Life) to provide flexibility to manage unexpected events across SA Water's asset base.

5.1.1 Facility Design Life

The definition of Design Life presented in Section 5.1 is concerned primarily with the Design Life of infrastructure (or its constituent components) **within** a given facility, to provide granular visibility of SA Water's default expectations with respect to these items.

Section 2 provides exclusions not covered by this Technical Standard, which primarily cover strategic decisions around the management of infrastructure.

However, the tables provided in Appendix A may be used to inform Facility Design Life (should one be required but not designated) through examination of the infrastructure/component with the longest Design Life (relative to the required outputs of a given project). The Design and Service Lives of remaining infrastructure/components may then be aligned to this.

Such an approach may lead to overly conservative outcomes, thus engagement with the project sponsor is highly recommended.

5.2 Service Life

SA Water's definition of Service Life is derived from ISO 13823 but tailored to suit the range of infrastructure and constituent components for which SA Water is responsible. It is defined as "the **actual period** during which infrastructure (or its constituent components) satisfy the design performance requirements without unforeseen major repair or maintenance, when used for its intended purpose and under the expected conditions of use." It represents the minimum time for which infrastructure, or its components are expected to perform without major repair or maintenance.

5.3 Distinction Between Design and Service Life

While the terms Design Life and Service Life may appear to be broadly the same at face value, there is a clear distinction in the objectives of each term and the impact on an infrastructure longevity.

The Design Life represents the total expected time for which infrastructure (or its constituent components) is to function as originally intended, whereas the Service Life is the timeframe of operation before major repair or maintenance is required. This difference is represented graphically in Figure 1 below.

Figure 1 illustrates the various stages of infrastructure life as follows:

- Design Stage
    - The Designer shall consider all the owner's requirements, including Design Life, likely maintenance regime, environmental and operational factors that could affect the durability of the asset. Infrastructure is then to be designed and detailed to achieve the minimum required Design Life and Service Life, while also facilitating necessary inspection/maintenance activities required while in service.
- Construction Stage
    - During this stage, the Constructor shall aim to deliver infrastructure that closely follows the engineering design details and is of the required standard and quality.
- Operational Service Life Stage
    - Completion of the Construction Stage marks the start of the Operational Life, which could be considered as its 'birth.'
    - During this period, infrastructure is expected to undergo regular inspections and maintenance by the owner. When a minimum acceptable condition is reached (i.e., at the end of Service Life), life is prolonged by major repairs/upgrades. With maintenance and repairs/upgrades, the life of the asset is expected to extend beyond the Design Life period (per Section 5.1).

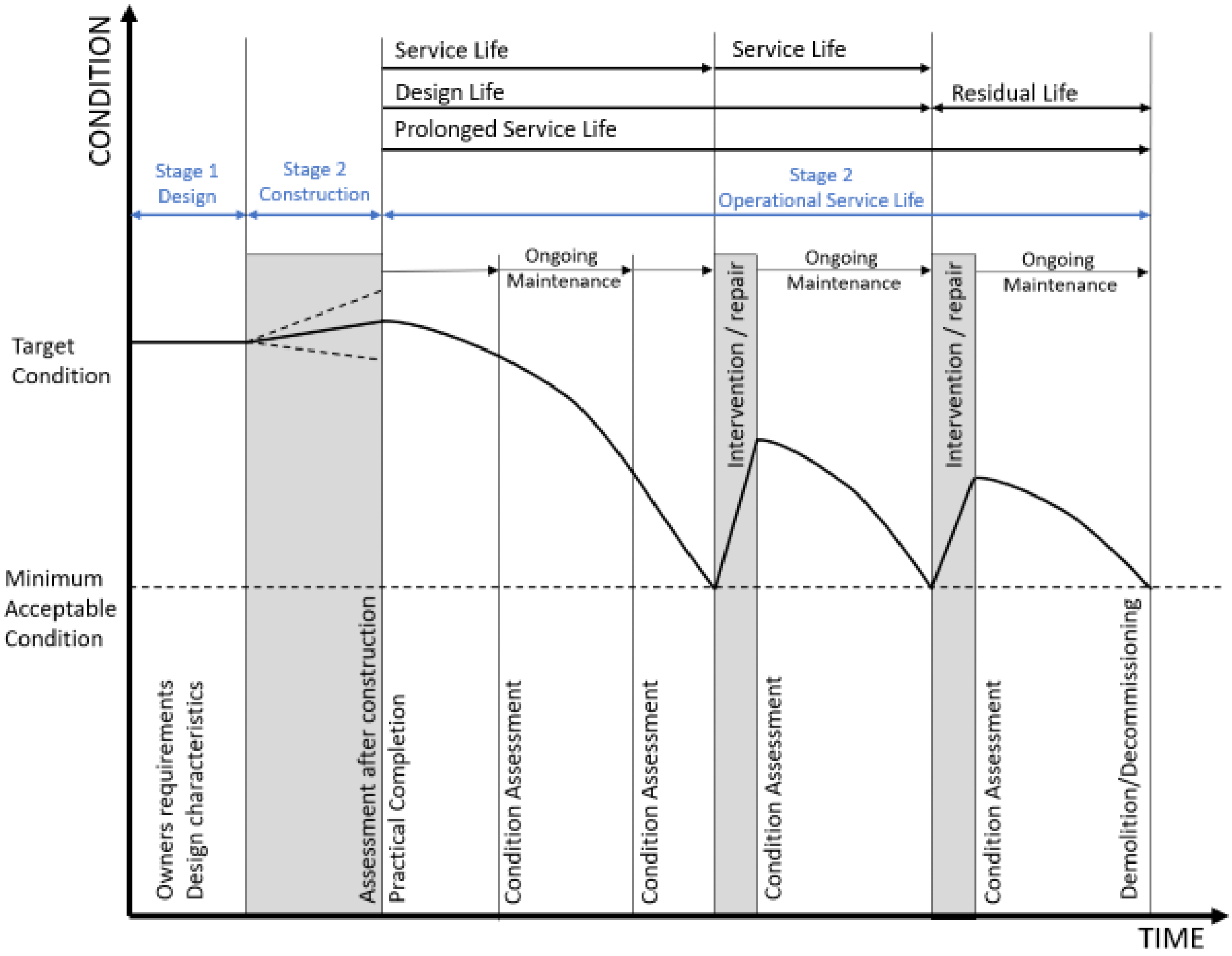

Figure 1 - Diagrammatic Representation of Design and Service Life

Where the Service Life of constituent components of infrastructure are not the same as, or greater than, its Design Life, these components **must be inspectable, replaceable, and maintainable within existing and probable operational limitations.** It is expected that these considerations are factored into the Safety in Design process (refer TS 0101) to ensure safe access and operation can be achieved to undertake these activities.

For some critical infrastructure and associated components, the Service Life is taken to equal the nominated Design Life. While regular maintenance is to be conducted, the expectation is that no major repairs would be required.

6 Minimum Design Life

6.1 General

Design Life will vary according to the type and use of infrastructure or component being considered. In assigning a Design Life, consideration should be given to the availability/reliability of infrastructure (or its constituent components), to ensure a balanced approach in terms of costs and operational risks.

In specifying the minimum Design Life for its infrastructure, SA Water has adopted an approach based on the following principles:

1) Criticality - Critical infrastructure warrants greater Design Life
2) Redundancy – Critical infrastructure may require minimum levels of redundancy and/or increased Design Life
3) Accessibility - Infrastructure that is inaccessible for maintenance and repair warrants greater Design Life
4) Failure - Infrastructure which has a significant impact on the community or services in the event of failure warrants greater Design Life

Infrastructure shall be designed such that deterioration over its Design Life does not impair the performance of the asset or component below that required or intended, having due regard to the operating environment (including limitations), the anticipated level of maintenance required, and capability and/or budget available to deliver inspection/maintenance activities.

6.2 Minimum Design and Service Life of Components (Default)

The Design Life and Service Life requirements for SA Water infrastructure have been summarised and provided in Appendix A. These values represent the default minimum's SA Water expects its infrastructure to achieve, noting that they may be varied as situations/projects require using the process described in Section 6.3.

Tables 3 to 11 (inclusive) deal with the Design and Service Life requirements for **new** SA Water infrastructure, along with other durability requirements, as necessary. Table 12 deals with the Design and Service Life requirements for rehabilitations undertaken on **existing** SA Water infrastructure.

Where no Service Life is specified in any of the tables in Appendix A, it shall be taken to equal the nominated Design Life.

6.2.1 Design/Service Life Considerations

Factors that are to be considered in determining the Design/Service Life of an asset or its constituent components include, but are not limited to, the following:

- The Design Life of the infrastructure into which it is placed (e.g., process equipment, switchboards, pumps etc.)
- Exposure conditions (i.e., environmental action),
- The difficulty and cost of maintenance/replacement.
    - This must also consider accessibility and operational requirements, through effective engagement with key Maintenance and Operational stakeholders.
- The consequences of failure of the asset/component in terms of disruption, redundancy, operation, and cost to repair.
- Hazards associated with maintenance, repair, or failure.
- Current and future availability of suitable components, and
- Technical or functional obsolescence.

Where a TDRF is lodged to deviate from the requirements stated in this Standard, details on these items will be sought to ensure due consideration of the proposal, with input from key stakeholders, has occurred.

6.3 Deviation from Default Design and Service Lives

Proposals to deviate from the default Design and/or Service Lives established in this Technical Standard may occur at various stages of delivering an infrastructure project.

The timing of these changes can have a material impact on outcomes SA Water have committed to with both customers and regulator, and thus need to be effectively managed.

This section details how this shall occur, where the proposed change to Design and/or Service Life is proposed:

- Before project initiation or
- After project initiation

Detail regarding the determination of Facility Design Life is provided in Section 5.1.1, which may also influence outcomes with respect to this section (subject to the timing of such a decision being made, relative to project initiation).

6.3.1 Before Project Initiation

Changes to infrastructure Design and/or Service Lives proposed before a project is initiated (which may or may not be related to decisions taken with respect to Section 5.1.1) will be specified by the project sponsor upfront via Insight, based on any project specific requirements that may differ from those presented in Appendix A.

Where this information is not nominated, the requirements provided in Appendix A of this Technical Standard shall apply as the default position.

6.3.2 After Project Initiation

Proposed changes to infrastructure Design and/or Service Lives after a project is initiated reflects a changed outcome compared to the original commitment made by SA Water to both customers and regulator via its regulatory submission. Thus, additional rigour in understanding the impacts of these changes is required, compared with that of Section 6.3.1.

Where such changes are proposed, a TDRF shall be completed. In addition to the requirements contained in the TDRF itself, the submission is to contain the following:

- Details of (select either or both as appropriate):
  - Information addressing the considerations presented in Section 6.2.1
  - Decision making with respect to Section 5.1.1
- A NPV analysis of the proposed change in Design and/or Service Life against the original requirement (inclusive of both operational and capital expenditure)
  - This requirement may be waived at the discretion of the project sponsor, and endorsement of this must be provided.
- Endorsement of the TDRF from the project sponsor

Appendix A: Design Life Tables

Appendix A1 - SA Water Infrastructure Design and Service Life (New)

Table 3 - Potable and Recycled Water (Pressurised Systems) (New)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Concrete structures *(associated with pipework installation and operation)*	100	50	Including pipe chairs, anchor/thrust blocks, valve chambers, etc. Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710.
Metallic support structures	100	25	
Surge/Pressure vessels	100	25	Design Life of 100 years is for pressure vessel shell and can be achieved with application of internal and external protective coatings, as required, along with corresponding maintenance of these. Design shall comply with TS 147, with external and internal coatings, suited to the external environment and internal fluid characteristics to be provided. For the pressure vessel and its components, the Design Life shall make provision for corrosion allowance in accordance with AS 1210, to safeguard against wall thickness loss due to corrosion or any material degradation.
Buried Pipe:			
Shall comply with TS 0503 and TS 0522 for pipe sizes with diameters ≤ 375mm. Protection of buried steel pipework to comply with TS 18 and manufacturer's proprietary coating system/s. Where pipe is to be situated in ground contaminated with organic chemicals/solvents (PFAS, Petroleum products, TCE etc.): • Resistance to permeation for pipes manufactured using polymeric materials is to be confirmed with the manufacturer <u>prior to installation.</u> • Rubber ring joints shall not be used. Corrosive environments may require steel pipes to be provided with cathodic protection, with pipe to be welded or have double bond across RRJ for electrical continuity.			
Mild Steel *(without CP)*	100		Steel pipework shall be provided with external and Internal protective coatings/linings, to ensure Design Life is achieved.
Mild Steel *(with CP)*	150		Steel pipework shall be provided with external and Internal protective coatings/linings and cathodic protection to ensure Design Life is achieved.
Stainless Steel	100		Stainless Steel is not preferred by SA Water as pipework for buried applications and shall not be used. Where use of stainless steel in a buried application is proposed, a TDRF is to be submitted, noting that particular attention must be given to the selection of the appropriate type/grade **and** fabrication/installation techniques to ensure Design Life is achieved.

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Ductile Iron	100		Limited repair options available which is to be considered where used on systems with limited redundancy. Ductile iron pipework shall be provided with external and Internal protective coatings/linings, to ensure Design Life is achieved.
PVC	100		Degradation of material based on disinfection type and water temperature shall be accommodated to ensure Design Life is achieved. Fatigue and the impact of transient events shall also be considered.
HDPE	100		Degradation of material based on disinfection type and water temperature shall be accommodated to ensure Design Life is achieved. Fatigue and the impact of transient events shall also be considered.
GRP	-		Not permitted.[1]
ABS	-		Not permitted.
Above Ground Pipe (outdoor):			
Shall comply with TS 0503 and TS 0522 for pipe sizes with diameters ≤ 375mm. Protection of above ground steel pipework to comply with TS 16. Pipelines >50m in length shall be mild steel or ductile iron.			
Mild Steel *(no CP)*	100	50	Steel pipework shall be provided with external and Internal protective coatings/linings, to ensure Design Life is achieved.
Ductile Iron	100	50	Not commonly used for above ground applications. Steel pipework shall be provided with external and Internal protective coatings/linings, to ensure Design Life is achieved.
Stainless Steel	100		
PVC	25		Protective coating to resist UV degradation shall be provided Degradation of material based on disinfection type and water temperature shall be accommodated to ensure Design Life is achieved. It is understood that temperatures to TS 0230 may exceed vendor specified maximum temperatures related to warranties.
HDPE	25		Protective coating to resist UV degradation shall be provided. Pipe material to contain a minimum of 2% carbon black. Degradation of material based on disinfection type and water temperature shall be accommodated to ensure Design Life is achieved.
GRP	100	50	<u>Only permitted for above ground applications within treatment facilities.</u> Centrifugal casting (or CFW) GRP is not permitted unless TDRF is lodged and approved by SA Water. Protective coating/additives to resist UV degradation shall be provided.
ABS	-		Not permitted.

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Above ground pipe (indoor):			
Shall match Design Life of building in which pipework is situated.			
Submerged pipe:			
Shall match Design Life of buried pipework or structure in which it is situated (if any). Submerged steel pipes shall be protected with manufacturer's proprietary coating system and / or in accordance with requirements of TS 15.			

1) *The performance of GRP pressure pipe subjected to systemic fatigue is highly dependent on:*
   - *The type and integrity of manufacturing process used (inclusive of materials/resins)*
   - *Backfill design to ensure sufficient structural support and*
   - *Construction practices (handling, placing, backfilling etc.) that recognise the brittle nature of the material and protect it from damage (which can be difficult to detect) while also achieving backfill performance requirements.*

   Issues arising from any one of these factors can result in premature failures that are difficult and costly to repairs compared against other pipe materials, especially in larger diameters (for example, MSCL).

Table 4 - Wastewater Pipework (Pressure and Gravity Systems) (New)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Buried Pipe:			
Shall comply with TS 0502 for pipe sizes with diameters ≤ 375mm. Protection of buried steel pipework to comply with TS 18 and manufacturer's proprietary coating system/s. Corrosive environments may require steel pipes to be provided with cathodic protection, with pipe to be welded or have double bond across RRJ for electrical continuity.			
Mild Steel *(with CP)*	150		Steel pipework shall be provided with external and Internal protective coatings/linings and cathodic protection, to ensure Design Life is achieved. Calcium Aluminate Cement/Plastic Lining shall be considered for internal lining.
Mild Steel *(without CP)*	100		Steel pipework shall be provided with external and Internal protective coatings/linings, to ensure Design Life is achieved. Calcium Aluminate Cement/Plastic Lining shall be considered for internal lining.
Stainless Steel	100		Stainless Steel is not preferred by SA Water as pipework for buried applications and shall not be used. However, if they must be buried, a TDRF is to be submitted, noting that particular attention must be given to the selection of the appropriate type/grade and fabrication/installation techniques to ensure Design Life is achieved.
Ductile Iron	100		Limited repair options available which is to be considered where used on systems with limited redundancy. Steel pipework shall be provided with external and Internal protective coatings/linings, to ensure Design Life is achieved. Calcium Aluminate Cement shall be considered for internal lining.
PVC	100		For rising mains, degradation of material based on fatigue shall be accommodated to ensure Design Life is achieved.
RCP *(with corrosion protection)*	100		Corrosion protection options may include calcareous aggregate, HDPE lining etc. The intent of the corrosion protection is to provide protection to the concrete such that the RCP achieves the nominated Design Life. For use in gravity applications only, not permitted for use on rising mains.
RCP *(without corrosion protection)*	50		For use in gravity applications only, not permitted for use on rising mains.
HDPE	100		
GRP	100		**For use in gravity applications only**, not permitted for use in pressure systems.[1] Centrifugal casting (or CFW) GRP is not permitted unless TDRF is submitted and approved by SA Water.
ABS	-		Not permitted

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Above Ground Pipe (outdoor):			
Shall comply with TS 0502 for pipe sizes with diameters ≤ 375mm. Protection of above ground steel pipework to comply with TS 16. Pipelines >50m in length shall be mild steel or ductile iron.			
Mild Steel *(no CP)*	100	25	Steel pipework shall be provided with external and Internal protective coatings/linings, to ensure Design Life is achieved. Calcium Aluminate Cement shall be considered for internal lining.
Stainless Steel	100		
Ductile Iron	100	25	Not commonly used for above ground applications. Steel pipework shall be provided with external and Internal protective coatings/linings, to ensure Design Life is achieved. Calcium Aluminate Cement shall be considered for internal lining.
PVC	25		Protective coating to resist UV degradation shall be provided. Degradation of material based on temperature shall be accommodated to ensure Design Life is achieved. Temperatures to TS 0230 may exceed vendor specified maximum temperatures related to warranties which is to be examined and considered during design.
HDPE	25		Protective coating to resist UV degradation shall be provided. Pipe material to contain a minimum of 2% carbon black. Degradation of material based on temperature shall be accommodated to ensure Design Life is achieved.
GRP	100	50	Only permitted for above ground applications in treatment facilities. Centrifugal casting (or CFW) GRP is not permitted unless dispensation is approved by SA Water. Protective coating/additives to resist UV degradation shall be provided.
ABS	-		Not permitted
Above ground pipe (indoor):			
Shall match Design Life of building in which pipework is situated.			
Network Structures:			
Concrete or Composite Structures *(critical infrastructure)*	100	50	Including access chambers, maintenance structures/shafts etc. Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710. Corrosion protection may include liners (such as PVC or HDPE), calcareous aggregates or use of composite materials. The intent of the corrosion protection is to provide protection to the concrete such that the structure achieves the nominated Design Life.
Concrete or Composite Structures *(non-critical infrastructure)*	50	25	Including access chambers, maintenance structures/shafts etc. Concrete design shall comply with the durability requirements of AS3600 and TS 0710.

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Educt Vents:			
Vent Tube	25		Where steel vent tube is used, external and internal protective coatings complying with TS 55 shall be provided to achieve the required Design Life. Where GRP is used, a protective coating/additive to resist UV degradation shall be provided.
Vent Tube Base *(steel)*	50	25	Vent tube bases in accordance with TS 54 and epoxy lined internally and externally in accordance with TS 16.
Footings *(concrete)*	100		Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710.

1) The performance of GRP pressure pipe subjected to systemic fatigue is highly dependent on:

- *The type and integrity of manufacturing process used (inclusive of materials/resins)*
- *Backfill design to ensure sufficient structural support and*
- *Construction practices (handling, placing, backfilling etc.) that recognise the brittle nature of the material and protect it from damage (which can be difficult to detect) while also achieving backfill performance requirements.*

Issues arising from any one of these factors can result in premature failures that are difficult and costly to repairs compared against other pipe materials, especially in larger diameters (for example, MSCL).

Table 5 – Civil, Structural and Geotechnical Works (New)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
General:			
Road base	50	25	Including base and sub-base courses, with regular maintenance is to be conducted.
Road wearing course	25		
Embankments	100		Including levees
Critical Retaining walls	100		Concrete design shall comply with the durability requirements of AS5100.3 and TS 0710.
Non-critical Retaining Walls	50		Concrete design shall comply with the durability requirements of AS3600 and TS 0710.
Slabs on ground	50		Including aprons, footpaths, plinths, pavement, drains, kerbs. Excludes slabs for tanks. Concrete design shall comply with the durability requirements of AS3600 and TS 0710.
Culverts	100		Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710.
Bridges	100		Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710.
Tunnels	100		Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710.
Buildings	50		Including depots, administration, control rooms, workshops, dosing stations, valve houses etc., unless noted otherwise in Tables 7 and 8.
Roof structures	50	25	Applicable to timber and steel roof structures of common buildings and outbuildings (such as shelters, verandas, carports etc). For other types of roof structures, Design Life to be decided based on material life expectancy.
Precast elements	50		Only applicable to vendor supplied precast concrete or composite elements, such as sumps for stormwater applications or cable pits for electrical installations where not impacting on Design Life of other structural components. All other precast elements (maintenance shafts, tilt up building panels etc.) **are excluded.**
Roof sheeting *(low to moderate corrosivity environments)*	30		Applicable to roof sheeting (metallic) for Buildings & Outbuildings in C1 to C3 corrosivity exposure environments in accordance with AS4312. Colorbond (including Ultra), Galvanised Iron or equivalent may be used. If project requirements warrant longer Design Life for roof component due to access/redundancy/other reasons, roof sheeting as per high corrosivity environments shall be considered.
Roof sheeting *(high corrosivity environments)*	60		Applicable to roof sheeting (metallic) for Buildings & Outbuildings in C4 to C5 corrosivity exposure environments in accordance with AS4312. Marine grade (5000 series) Aluminium, Colorbond Ultra (for low C4 environments only, in consultation with SA Water), Superdura Stainless Steel or equivalent may be used.

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Access Structures:			
Grids and covers	50	25	Steel, FRP and other types
Walkways, ladders, and stairways	50	25	Steel, FRP and other types
Tanks:			
Base slab	100		Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710.
Walls *(Concrete)*	100		Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710.
Walls *(Steel, FRP etc)*	50	25	Coating, lining, cathodic protection (for steel) etc. should be considered for aggressive environments, to achieve Design Life.
Columns *(Concrete)*	100		Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710. Coating, lining, or wrapping should be considered for aggressive environments, to achieve Design Life.
Columns *(Steel, FRP etc)*	50	25	Coating, lining, or wrapping should be considered for aggressive environments, to achieve Design Life.
Linings	-		Refer Tables 12 and 13.
Roof structures	100	40	Metallic roof structures. Steel coated with Hot dip galvanizing to HDG900 grade, Marine grade aluminium or similar, to achieve Design Life.
Roof sheeting	60		Refer civil and structural works for High Corrosivity Environments. Roof ventilation shall be considered as part of the tank roof design.
Turbine vents	30	20	Vents to be in accordance with TS 0721
FRP Tanks – Chemical Service	20		Tanks to be designed in accordance with AS 2634 or BS EN 13121. Protective coating/additives to resist UV degradation shall be provided. For chemical storage tanks (esp. Sodium Hydroxide, Sodium Hypochlorite and Sulphuric Acid), inspections in accordance with the manufacturer's recommendations are required to achieve design life.
HDPE Tanks – Chemical Service	20		Tanks designed in accordance with AS/NZS 4766. For chemical storage, polyethylene grades to be suitable for the chemical to be stored.
Earth Bank Storages and Wastewater Lagoons:			
Inlet and Outlet pipes	100		Applicable to all types of pipes to be used for this application. Refer to Tables 3 and 4 for notes relevant to pipe types. External and internal coatings/lining shall be considered where required to achieve Design Life.
Earth Embankment	100		
Concrete structures	100	50	Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710 for 100 years Design Life.

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Flexible cover and liner	30		Design Life of cover and liner is dependent on the specific product chosen. Aim is for products with appropriate properties and long-life expectancy per guidance provided in TS 0460.
Batten strips and Anchors	100	15	Replacement of EPDM rubber batten strips and anchor bolts re-tensioning expected at 15-year intervals.
Mechanical assets	25		Including cover stormwater pumps, leakage pumps, level control devices etc.
Electrical assets	-		Refer electrical equipment
Cranes and Lifting Equipment:			
Runway and supporting structures	50	25	
Cranes	50	25	

Table 6 – Dams[1]

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Concrete	100		Concrete design shall comply with the durability requirements of AS5100.5, TS 0710 and applicable ANCOLD guidelines.
Earth Embankment	150		
Infrastructure that is inaccessible/ embedded	150		Special strength and durability design considerations shall be considered, over and above the Australian Standards requirements, to achieve Design Life and satisfy ANCOLD guidelines.
Structures that: - Are accessible/ embedded **and** - Do not have dam safety implications	100	50	Adoption of these Design and Service Life values is also subject to structures that **satisfy both** conditions provided in the asset/material column.
Anchors	100		Including post-tensioned, Macalloy bars etc.

1) *Excluding Earth Bank Storages, Wastewater Lagoons, and infrastructure with Dam Safety implications*

Table 7 - Water and Wastewater Pump Stations (New)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Critical Water Pump Stations:			
Critical water pump stations are defined as those located on SA Water Major Pipelines and Trunk Mains (per TS 0136).			
Building	100		Includes wall structure and foundations.
Shelter/Shed	50	25	For frequent use outbuilding shelters/sheds attached to buildings or free standing.
Roof structure	-	-	Refer Table 5.
Roof sheeting	-	-	Refer Table 5.
Pumps	50	25	Routine maintenance in accordance with Manufacturer's requirements will be undertaken by SA Water, with provision for this shall be provided.
Pipework	-		Refer potable/recycled water pipework as appropriate.
Valves	50	25	Refer TS 0230, applies to gate and butterfly valves.
Non-critical Water Pump Stations:			
Building			Refer Table 5. Includes wall structure and foundations.
Shelter/Shed	15		For low-risk infrequent use applications only.
Shelter/Shed	50	25	For frequent use outbuilding shelters/sheds attached to buildings or free standing.
Pumps	25		Routine maintenance in accordance with Manufacturer's requirements will be undertaken by SA Water.
Pipework	-		Refer potable/recycled water pipework as appropriate.
Valves	50	25	Refer TS 0230, applies to gate and butterfly valves.
Critical Wastewater Pump Stations:			
Critical wastewater pump stations are defined as those having flows ≥ 150 L/s.			
Concrete structures	100	50	Including wet wells, dry wells, and valve chambers. Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710 Coating, lining etc shall be considered for aggressive environments, to achieve the Design Life.
Building	100		Including wall structure and foundations.
Roof Structure			Refer Table 5.
Roof Sheeting			Refer Table 5.
Pumps	40	25	Applies to both dry & wet well pumps. Routine maintenance in accordance with Manufacturer's requirements will be undertaken by SA Water.
Pipework	-		Refer wastewater pipework as appropriate.
Valves	50	25	Refer TS 0230, applies to gate and butterfly valves.

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Non-critical Wastewater Pump Stations:			
Concrete structures[1] *(critical infrastructure)*	100	50	Including wet wells, dry wells, and valve chambers
Concrete structures[2] *(non-critical infrastructure))*	50	25	Including wet wells, dry wells, and valve chambers
Building			Refer Table 5. Includes walls and foundations
Roof structure			Refer Table 5.
Roof sheeting			Refer Table 5.
Pumps	25		Routine maintenance in accordance with manufacturer's directions required.
Pipework	-		Refer wastewater pipework as appropriate.
Valves	50	25	Refer TS 0230, applies to gate and butterfly valves.

1) *Refers to concrete elements deemed critical to the operation/function of a non-critical wastewater pump station.*
2) *Refers to concrete elements deemed non-critical to the operation/function of a non-critical wastewater pump station.*

Table 8 - Treatment Plants (inc. Desalination and Recycled) (New)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Inlet/Transfer pumps	50	25	Routine maintenance in accordance with Manufacturer's requirements will be undertaken by SA Water.
Concrete process structures *(critical infrastructure)*	100		Including inlet works, process tanks, galleries, open pipeline chambers, cast in piping etc. Concrete design shall comply with the durability requirements of AS5100.5 and TS 0710 for 100-year Design Life. Coating, lining etc should be considered for aggressive environments, to achieve Design Life.
Concrete process structures *(non-critical infrastructure)*	50		Including inlet works, process tanks, galleries, open pipeline chambers, cast in piping etc. Concrete design shall comply with the durability requirements of AS3600.5 and TS 0710 for 50-year Design Life. Coating, lining etc should be considered for aggressive environments, to achieve Design Life.
Steel process units *(critical infrastructure)*	50	25	Including steel and stainless-steel process units, screens, tanks etc.
Steel process units *(non-critical infrastructure)*	25		Including steel and stainless-steel process units, screens, tanks etc.
Support structures	50	25	Including pipework support, elevated inlet works supports etc.
Building	100		Including walls and foundations.
Roof structure	-		Refer Table 5.
Roof sheeting	-		Refer Table 5.
Pipework	-		Select from Tables 3 and 4 as appropriate.
Mechanical equipment	25		Including centrifuges, presses, diffusers, gearboxes, mixers, injectors, compressors, conveyors, scrapers, slakers, dryers, diffusers, vibrators, heat exchangers etc.
Chloring Dosing Systems	15		Including piping, pumps, injectors, vacuum regulators, leak detection equipment.
UV Reactors	25		
Filters	25		
Membranes	7		Refers to membrane elements only
Membrane Plant	15		

Table 9 - Mechanical Equipment (New)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Valves:			
Isolation	50	25	Refer TS 0230, applies to gate and butterfly valves
Actuators	25		Includes electrical and pneumatic
Network valves *(e.g., control/globe)*	25		
Modulating valves *(e.g., butterfly)*	25		
Other:			
HVAC	25		Includes constituent components (excluding filters)
Flowmeters *(mechanical components*	25		
Flowmeters *(electrical components*	15		

Table 10 - Electrical Equipment (New)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Instrumentation and control	15		Including PLC, HMI, telemetry, instrumentation, communications equipment, batteries/uninterruptible power supply, gas detection systems and SCADA. Shall comply with AS/NZS 3000 and TS 0300 requirements.
Motors	25		Including VSD/VFD's. Shall comply with AS/NZS 3000 and TS 0300 requirements.
Electrical equipment/ switchgear	25		Shall comply with AS/NZS 3000 and TS 0300 requirements.
Transformers	50		Shall comply with AS/NZS 3000 and TS 0300 requirements.
Fire Equipment	15		Includes alarms and fire prevention equipment. Shall comply with AS/NZS 3000 and TS 0300 requirements.

Table 11 - Protection Systems (New)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Coatings, Wrappings and Linings:			
Coatings, wrappings, and linings provide protection or function as a sacrificial layer to increase Design Life. The Design Life of the component includes the protective coating, whose Service Life may be the same as that of the component being protected, or less (with replacement/repairs being required at specified intervals).			
Tape wrapping systems	50		Including petrolatum and bitumastic systems.
Industrial coating systems *(non-concrete structures)*	25		To be selected based on environmental conditions as per AS2312 and WSA201. Includes liquid applied coatings.
Industrial coating systems *(concrete structures)*			Refer to Table 12
Linings			Refer to Table 12
Cathodic Protection:			
Galvanic cathodic protection	15		To comply with AS2832 and TS 0440. Anodes to be replaced after achieving design life.
Impressed current transformer rectifier unit	25		
Impressed current ground bed	25		
Test Points and other cathodic protection hardware	25		

Appendix A2 - SA Water Infrastructure Design & Service Life (Rehabilitation)

Table 12 - SA Water Design and Service Life (Rehabilitation)

Asset/Material	Minimum Design Life (years)	Minimum Service Life (years)	Notes
Concrete Rehabilitation:			
Concrete repairs	40		
Crack repairs	40		Applies to assets exposed to wet/damp environment per TS 0711
Crack repairs	30		Applies to assets exposed to atmosphere per TS 0711
Protective coating	25		Applies to assets exposed to atmosphere per TS 0711
Protective coating	40		Applies to assets that are submerged, located in the splash zone, or exposed to aggressive chemicals per TS 0711
Liners	35		E.g., Full internal flexible synthetic membrane liner. Shall be selected based on product compatibility to component material to which lining is being applied.
Joint Rehabilitation:			
Flexible sealant	25		Exposure to corrosive environments to be accommodated in wastewater applications.
Bandage Tape	40		E.g., Hypalon tape.
Drop–in/Loose Liner	35		E.g., Floor flexible synthetic membrane liner extending 1m up from tank floors.
Internal Columns:			
Epoxy Protective coatings	40		
Top section repair	40		Applicable mainly to water tank columns. Includes repair methods such as patch repair with FRP wrap, saw cut and installation of stainless steel or precast concrete stub or form and pour.
Full height encapsulation	40		Applicable to water tank columns for strengthening and protection.
Full height replacement	100		Includes replacement with precast concrete or FRP.
Other:			
Structures	25		Including walkways, platforms, access etc.
Pipe relining	50		Includes structural liners. Design Life provided is nominal, as SA Water seeks to achieve the longest possible Design Life from relining works that is commercially available. Preference is for 80 - 100 year Design Life.