



Government  
of South Australia



## Engineering Services

### Technical Standard **TS 0720**

### Access Infrastructure for Water Tanks

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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.




## Document Controls

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# 1 Introduction

SA Water owns and operates numerous above ground water storage tanks and they vary in size and physical and material characteristics. Access to tank roofs has traditionally been provided through the use of vertical or inclined ladders. Trap doors or sliding hatches with T-bar provided access to the interior of the tanks. The access infrastructure provided has sometimes lacked consistency of approach for construction details.

## 1.1 Purpose

The purpose of this Technical Standard is to deliver infrastructure to allow safe access to the roofs of above ground or partly buried tanks using a consistent approach to the design and construction of such assets and align with current safe practices while meeting operational and maintenance requirements.

The purpose of this standard is to provide safe access to the water storage tank roofs for regular inspections, maintenance activities and water quality testing by SA Water personnel, alliance partners and approved contractors without the need to use personal protective equipment.

## 1.2 Glossary

The following glossary items are used in this document:

Term	Description
SA Water	South Australian Water Corporation
SFAIRP	So Far As Is Reasonably Practicable
TG	SA Water Technical Guideline
TS	SA Water Technical Standard

## 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
AS/NZS 1554	Structural Steel Welding
AS/NZS 1664	Aluminium Structures
AS/NZS 1665	Welding of Aluminium Structures
AS 1657	Fixed platforms, walkways, stairways and ladders – Design, construction and installation
AS/NZS 1734	Aluminium and aluminium alloy – flat sheet, coiled sheet and plate
AS/NZS 1866	Aluminium and aluminium alloys – extruded rod, bar, solid and hollow shapes
AS/NZS 1891.1	Industrial fall-arrest systems and Devices - Harnesses and ancillary equipment
AS 3600	Concrete structures
AS/NZS 3678	Structural Steel- Hot-Rolled Plates, Floorplates and Slabs
AS/NZS 3679.1	Structural Steel- Hot-Rolled Bars and Sections

Number	Title
AS 4100	Steel structures
AS/NZS 4600	Cold-formed steel structures
AS/NZS 4680	Hot-dip galvanised (zinc) coatings on fabricated ferrous articles

### 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 30a	Welding specification - welding and welding procedure qualification
TG 61	Practical understanding and interpretation of Technical Standard TS 30a, Welding specification - welding and welding procedure qualification
TS 95	Engineering drawing deliverable requirements
TS 106	Installation Standards for Electronic Security Systems on SA Water Sites
TS 107	Physical security standards
TS 155	Safety in design
TG 106	Design and documentation requirements for reinforced concrete circular surface water storage tanks & associated works
HMS-008	SA Water Hazard Management Standard "Working at Heights"
	WHS Legislative Requirements (e.g. Work Health and Safety Regulations 2012 (SA)-chapter 4, Part 4-Falls and CoP Managing the Risk of Falls at Workplace)
<a href="#">5007-00001-01 to 16</a>	Above Ground Tank Safe Access (Typical Drawings)

## 1.4 Definitions

The following definitions are applicable to this document:

Term	Description
SA Water's Representative	The SA Water representative with delegated authority under a Contract or engagement, including (as applicable): <ul style="list-style-type: none"> <li>• Superintendent's Representative (e.g. AS 4300 &amp; AS 2124 etc.)</li> <li>• SA Water Project Manager</li> <li>• SA Water nominated contact person</li> </ul>
Responsible Discipline Lead	The engineering discipline expert responsible for TS 0720 defined on page 3 (via SA Water's Representative)

## 2 Scope

This Technical Standard applies to external access infrastructure for above ground or partially buried water storage tanks. It includes external fixed ladders or stairs, service platform(s), sliding access hatches, sampling hatch, walkways, central anchor (fall restraint system), pedestrian link bridges, Davit crane mounting bracket, diver ladder brackets and associated structures and applies to access infrastructure for both new tanks and upgrades to existing tank infrastructure.

This Technical Standard applies to the provision of access to specific work areas on the tank roof, and as such, no provision has been made for walkways beyond the service platform except where a second hatch is to be provided on the opposite end of the tank roof for ventilation or to a pedestrian link bridge between tanks.

This Technical Standard does not apply to the following:

1. Tank internal fixed ladders and platforms.
2. Elevated water storage tanks.

This Technical Standard specifies requirements for the material selection, design and construction of tank access infrastructure and takes precedence over the tank access requirements in SA Water Technical Guideline TG 106.

## 3 Design, Fabrication and Installation of Access Infrastructure

### 3.1 General

All infrastructures shall comply with the requirements of AS 1657 unless otherwise stated herein. Some requirements stipulated in this Standard are based on safe work practices specific to SA Water, which may differ from, and shall take precedence over, the Australian Standards.

Tank access infrastructure shall be designed to provide safe tank roof access without the need to use PPE equipment (e.g. body harness, fall arrest system, etc.), unless approved by SA Water's Representative. Where the use of access PPE to safely access the tank roof cannot be overcome and is approved by SA Water's Representative, special infrastructure detailed in SA Water hazard management standard HMS-008 'Working at Heights' shall be provided at the site to ensure safe access is provided.

Any deviation from this Standard shall be approved in writing by SA Water's Representative.

### 3.2 Selection of Access Infrastructure

#### 3.2.1 General

This clause specifies the process by which the access method is determined.

The access method to be provided at any tank shall be one of the acceptable methods specified in clause 3.2.2, be determined in accordance with clause 3.2.3 using the principles described in clause 3.2.4 and shall be approved by SA Water's Representative.

#### 3.2.2 Acceptable Access Methods

Access to the tank roof shall be provided using one of the following methods:

1. Stairs.

2. Inclined ladders (when stairs not practicable and approved by SA Water).
3. Vertical ladders (exceptional circumstances only when above options cannot be provided).

### 3.2.3 Access Method Selection

The determination of the required access method may vary depending on the nature of the delivery process for a particular project.

The method of access to be provided shall be determined using one of the following:

1. SA Water – Concept Design has been undertaken prior to engagement of a Contractor and the preferred access method determined during this process is specified in the project specification.
2. The Contractor – Contractor is required to determine the required access method in accordance with this standard as part of their design responsibilities under the contract (i.e. the preferred access method is not specified in the project specification).

The method of access to be provided on each tank shall be approved by SA Water's Representative prior to manufacture or construction.

#### 3.2.3.1 Access Method Is Specified in Project Specification

The access method specified in the project specification (as determined by SA Water) was the method considered most suitable during the Concept Design phase of the project. This access method specified is subject to verification, and change if necessary, during the detailed design and associated safety in design processes undertaken by the detail designer in accordance with SA Water standard TS 155 "Safety in Design".

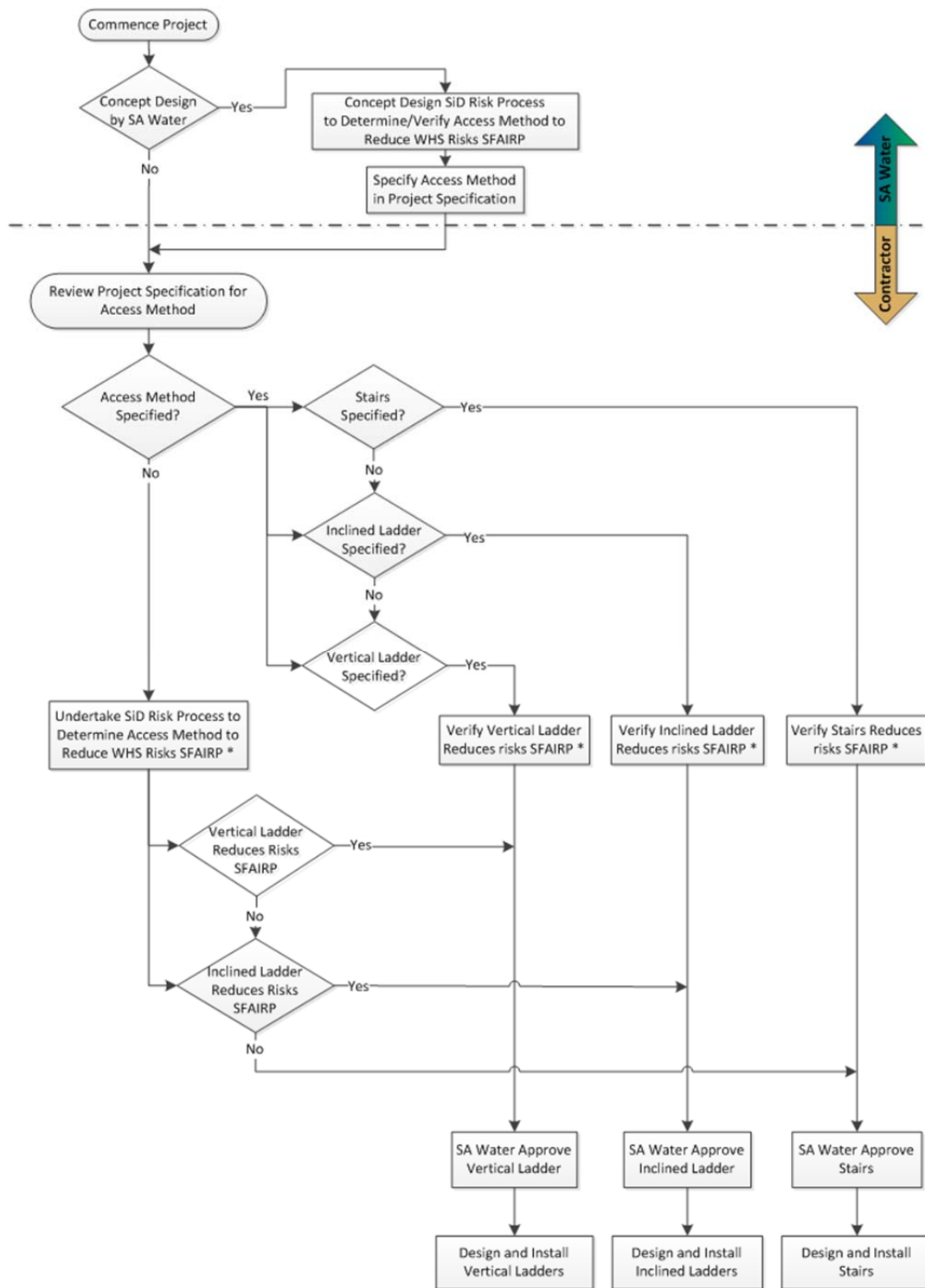
#### 3.2.3.2 Access Method Determined by the Contractor

Where the Contractor determines the preferred method of access for approval by SA Water, the decision shall follow the same process, except that the contractor will effectively undertake the initial selection of access method in addition to the detailed design verification of the method selected.

Figure 1 below gives the flowchart for the access selection process.



Figure 1 – Access Selection Process Flowchart



**Notes:**

\*To be undertaken by the Designer in consultation with SA Water.

SFAIRP = So Far AS IS Reasonably Practical (Refer to SA Water SiD Standard TS 155)

### 3.2.4 Risk and SiD Process

This clause shall apply where the contractor is required to determine the type of access to be provided in accordance with Figure 1.

A risk assessment methodology shall be used to determine the type of access infrastructure to be provided at each site. SA Water (or their alliance partners) operations and maintenance staff responsible for that site shall be part of the process. SA Water Safety in Design process (i.e. TS 155) and corporate risk process (where appropriate) shall be used. The access method to be provided shall be approved by SA Water's Representative.

Site specific factors shall be considered during this process which shall include (but not be limited to):

1. Adequate available space.
2. Height of tank wall from ground surface to tank roof.
3. Frequency of required access.
4. Reasons for accessing the water storage tank.
5. Single tank or group and proximity to each other.
6. Raw or filtered water tank and cleaning regime.

In exceptional cases, a vertical ladder fitted with static line (for tanks wall height in excess of 3.0 m) may be the most practical due to physical constraints and could be accepted, but only if all other access systems have been investigated and eliminated as inappropriate.

### 3.3 Typical Drawings

SA Water drawings 5007-00001-01 to 5007-00001-16 inclusive show Typical Details for Above Ground Tank Safe Access and include minimum requirements for stairs, inclined ladders and platforms. Note that these drawings show typical details for the case where the hatch and platform support beams are installed below the roof and brackets penetrate the roof sheeting to support the sliding hatch and platform framing. This is the typical support framing arrangement expected when the tank roof is being replaced or for new tanks. For instances where only the tank access is being upgraded, the support beams may be installed over the roof sheeting. Agreement shall be sought from SA Water Responsible Discipline Lead prior to designing the layout of above roof beam arrangement.

These drawings shall be used in conjunction with this Technical Standard for the development of site specific drawings for tank access infrastructure. All access infrastructures shall be designed in accordance with the typical drawings and this standard, unless otherwise approved by the Responsible Discipline Lead.

The contractor shall produce a set of detailed site construction drawings for each tank site which shall be used to construct and install access infrastructure at that site. Site construction drawings shall take account of, and allow for, all specific site conditions that are applicable to that site. The contractor may use relevant typical drawings as a basis for development of site construction drawings, however typical drawings shall not be used as construction drawings.

All site specific drawings shall comply with the requirements of TS 95 and shall be used by the contractor for all SiD risk assessments conducted for the site.

### 3.4 Alignment of external access infrastructure

The sliding access hatch and the service platform shall be installed side by side, with the roof ridge aligned with the centre of the sliding hatch. In the case of double width sliding hatch used in combination with a single width ventilation hatch, the ridge shall be aligned with the centreline of the ventilation sliding hatch.

Tank access shall be aligned from left to right in the following sequence: stair or ladder, service platform and sliding access hatch, where a circumferential stairs/ladder is used. If a radial ladder is used to access the service platform, it should be located as far away as possible from the sliding access hatch so that it will not interfere with the lifting/lowering of objects into and around the tank.

### 3.5 Materials

The following specifies the materials to be used for all components designed and installed under this standard:

1. All materials shall comply with relevant Australian Standards.
2. Materials selection shall be based on a minimum life to first maintenance of 25 years and a design life of 50 years for the access infrastructure.
3. The framing and cover of the sliding access hatch shall be fabricated from aluminium. The cover shall be manufactured from aluminium chequer plate. Aluminium sheeting or appropriately coated steel roof sheeting (such as Colorbond Ultra) with adequate end closures to ribs may be acceptable where approved by SA Water's Representative.
4. Aluminium or fully hot dipped galvanised steel or a combination of both shall be used for fabrication of ladders, stairs, service platforms, guardrails/handrails, pedestrian link bridges and other structural elements.
5. Fabrication shall be by welding or folding metal, e.g. ladder security door, unless otherwise approved by the SA Water Responsible Discipline Lead.
6. Security panels for ladder and stairs shall be aluminium.
7. Security mesh to be placed around lower landing knee braces and shall be manufactured of steel or aluminium.
8. Marine grade aluminium or heavy duty galvanised steel shall be used for all tank access infrastructure installed within 1 km from the coast. The roof sheeting shall be of Aluminium or Colorbond classic Ultra Steel.
9. Fasteners for aluminium and galvanised steel shall be galvanised steel or stainless steel.
10. Insulation washers or pads shall be used to separate dissimilar metals. Inserts are required for bolt holes.
11. Aluminium structural elements shall be insulated from concrete with a suitable insulation material with the approval of SA Water's Representative.

### 3.6 Connections

Connections for ladders, stairs, platforms and sliding hatches and associated support framing, handrails/guardrails, walkways and central anchor shall be designed in accordance with the Australian Standards. Material selection for fasteners shall give due consideration to compatibility of metals. Dissimilar metals shall be avoided; any dissimilar metals that are unavoidable shall be

insulated from each other. The method used shall be approved by the SA Water Responsible Discipline Lead.

Blind fasteners such as pop rivets (aluminium or steel) shall not be used for structural connections. Tek screws shall not be used with aluminium members. Structural blind fasteners shall be approved by SA Water Responsible Discipline Lead prior to use.

## 3.7 External Access System

### 3.7.1 General

This clause specifies the minimum requirements for each type of external access system.

The decision as to which access method is provided shall be made in accordance clause 3.2.

### 3.7.2 Stairs

The external stairs shall be in accordance with the following, as applicable:

1. Stairs geometry shall be in accordance with the requirements of AS 1657.
2. The width of stairs shall be 900 mm unless specified otherwise in the project specification.
3. A stairs with one or more intermediate landings shall be arranged circumferentially to the tank. Provide horizontal offset between runs in accordance with AS 1657.
4. Any continuous run greater than 4.0 m shall have a landing.
5. Where a landing platform is provided, it is preferable that equal stairs lengths are provided above and below the platform.
6. Minimum landing height above ground surface shall be 3.0 m unless otherwise approved by SA Water Security team and the SA Water Responsible Discipline Lead.
7. The circumferential stairs shall be installed in such a way that it does not pass under and in front of the service platform and sliding access hatch that will interfere with lifting of equipment onto the platform.
8. The design loads and deflection limits for stairs shall be in accordance with the requirements of AS 1657.
9. Guardrails/handrails shall be provided to sides of stairs, complying with the requirements of this standard and AS 1657.
10. A lockable security door with barbed-wire shall be provided at the stairs lower landing, in accordance with TS 107 requirements. For single flight of stairs, refer to the SA Water security group for a site security evaluation.
11. Security mesh shall be provided over the lower landing bracing struts, to prevent handhold.
12. A concrete landing slab of nominal dimensions 1.4 m wide by 1.5m long shall be provided at the base of the stairs. The top of slab shall be 50 mm minimum above the finished ground surface and the surrounding ground surface shall be locally build-up and graded to finish flush with the top of the concrete slab. If the landing slab is located within the area of the tank perimeter concrete apron/spoon drain, the design shall integrate the two slabs into one where possible to achieve best results.

### 3.7.3 Inclined Ladders

The external inclined fixed ladders shall be in accordance with the following, as applicable:

1. Ladders shall be rung type. Step type may be acceptable if approved by SA Water's Representative.
2. Inclined ladders shall be installed at a slope within the 'preferred range', as specified in AS 1657. Typically, rung type ladders shall be installed at a nominal angle of 70 degrees to the horizontal.
3. Ladder width shall be the maximum allowable width (525 mm) specified in AS 1657.
4. A ladder without intermediate landings shall be either circumferential or radial to the tank, subject to site conditions.
5. A ladder with one or more intermediate landings shall be arranged circumferentially to the tank. Horizontal offsets between runs shall be provided in accordance with AS 1657.
6. Any continuous ladder run with a fall distance (refer to HMS-008 for more details) greater than 4 m shall have a landing, except where the height of the tank wall above finished ground level is less than 6 m, in which case a single length ladder with cage may be used.
7. Where a landing platform is provided, equal ladder lengths should be provided both above and below the platform.
8. Minimum landing height above ground surface shall be 3.0 m.
9. The circumferential ladder shall be installed in such a way to ensure that it does not pass under and in front of the service platform and sliding access hatch that will interfere with lifting of equipment onto the platform.
10. The design loads and deflection limits for ladders shall be in accordance with the requirements of AS 1657.
11. On the bottom flight of the ladder, front and back security panels shall be installed in accordance with Security standard TS 107. For short exposed tank wall heights, refer to the SA Water security group for a site security assessment.
12. The front security panel shall be lockable and light weight, inclosing the ladder cage when it is in the closed position. A drop-bolt shall be provided to secure the panel to the concrete slab, when in the open position.
13. The back security panel shall have minimum toe clearance of 200 mm.
14. Connections of rungs to stiles shall be welded connections. Welds shall be free from burrs.
15. A ladder cage shall be provided where the ladder vertical height is 3.0 m or greater and to the first landing above the ground, where security panels are required. The ladder cage construction shall comply with the requirements of TS 107 and AS 1657.
16. Ladder cages and connections to stiles shall be so installed that they do not interfere with smooth continuous hand hold on the stile. Design of cages and stiles shall comply with AS 1657.
17. Security mesh shall be provided over the lower landing bracing struts to prevent handhold.

18. A concrete landing slab of nominal dimensions 1.9 m wide by 1.2 m long shall be provided at the base of the stairs. The top of slab shall be 50 mm minimum above the finished ground surface and the surrounding ground surface shall be locally build-up and graded to finish flush with the top of the concrete slab.

### 3.7.4 Vertical Ladders

Vertical ladders shall only be installed when:

1. They are determined by the designer to be the most suitable option for safe access in accordance with clause 3.2.3. and
2. They are demonstrated via the SiD process to reduce WHS risks SFAIRP. and
3. When approved by SA Water's Representative.

External vertical fixed ladders shall be in accordance with the requirements for inclined ladder as specified in relevant dot points in clause 3.7.3.

Equipment to facilitate the safe use of PPE equipment (as detailed in HMS-008) shall be installed on all vertical ladders with a height of 3.0 m or more. All PPE equipment shall comply with AS/NZS 891.1.

### 3.8 Sliding Access Hatch

Sliding hatches shall be in accordance with the following:

1. The hatch size shall be 2.4 m x 2.4 m for single width hatch and 4.2 m x 2.4 m for double width hatch unless other sizes are required for the site and application and approved by the SA Water Representative.
2. The sliding access hatch shall be mounted horizontally or at roof slope, subject to the slope not compromising ease of opening.
3. The sliding access hatch shall be located above the tank roof.
4. Flashings shall be provided, as necessary, to ensure opening is fully sealed and weatherproof/vermin proof. Flashing to be designed such that water does not pond on any side, allows uninterrupted flow to the tank edge.
5. Guardrails shall be provided on three of the four sides of the sliding access hatch. For the side that is closest to the tank centre, no guardrail is required.
6. The guardrail that borders the tank wall shall be installed on the edge of the sliding access hatch. This guardrail shall comply with the following:
  - a. Move with the sliding access hatch.
  - b. Provide personnel protection when the sliding access hatch is in the open position.
  - c. Provide a handhold for manually opening and closing the access hatch (in this instance, a dedicated handle for opening the access hatch is not required).
7. For safety reasons, an additional guardrail shall be installed on the tank wall, if the top of the tank wall is 1.0 m or less above the ground level for the width of the sliding hatch.
8. The sliding access hatch shall be fitted with a set of nylon travel and guide wheels at each corner. The wheels shall run in a pair of guide tracks located above the roof and fixed to the roof structure.

9. The wheels shall be designed so that they are durable, easily removable and replaceable.
10. Where specified in the scope of work or determined necessary during design development, a 600 mm x 600 mm aluminium sampling hatch with a lockable hinged lid shall be installed in the last third section of the sliding access hatch, adjoining the service platform. A gate in the platform guardrail shall be provided directly adjacent to the sampling hatch for access.
11. A cross member fabricated from two aluminium 50 x 6 Equal Angles welded together shall be installed within the sampling hatch opening for the support of water level measurement equipment.
12. Where a (new) sliding access hatch location is to be chosen, it shall be based on consideration of the following:
  - a. Site conditions around the tank which may impact on vehicle and pedestrian accessibility.
  - b. Slope of the tank roof at the proposed location and the impact this has with respect to mounting the access hatch horizontally above the roof.
  - c. The fact that a location immediately adjacent to the roof ridge minimises roof works required for rainwater drainage and diversion.
13. A padlock mechanism complying with the requirements of TS 107 shall be provided to lock the sliding access hatch in closed position, and a locking pin device provided to hold the access hatch in the open position.
14. The sliding access hatch shall be designed for a live load of 1.0 kPa.

### 3.9 Service Platform

Service platforms shall be in accordance with the following:

1. A nominal 2.4 m x 2.4 m service platform shall be provided adjacent to the single width sliding access hatch.
2. A nominal 1.2 m x 2.4 m service platform shall be provided on two sides for the double width sliding hatch and to one side of the ventilation hatch. The two service platforms shall be connected with a 900 mm wide walkway on the rear side of the sliding hatch.
3. The platform may be of extruded, formed, or grated type of floor covering and be slip resistant.
4. Be designed to prevent dirt accumulation between the platform and roof sheeting and for removal of such dirt. A minimum clear distance of 100 mm above the roof sheet ribs shall be provided.
5. The service platform shall be designed for live loads in accordance with AS 1657.
6. The platform shall be nominally horizontal, in accordance with the requirements of AS 1657.
7. Guardrails and kickboards shall be installed on the perimeter of the service platform, in accordance with AS 1657.
8. The guardrail adjoining the sampling hatch shall be fitted with a self-closing gate. The posts supporting this gate shall be located within the extent of the hatch opening, to allow for the fitting and safe use of the divers ladder.
9. The gate shall be able to be secured in the open position when accessing the sampling hatch.

10. Guardrails shall be supported on structural members and comply with AS 1657.
11. A non-self-closing gate shall be provided for access to the tank roof beyond the service platform. Walkway(s) beyond the gate shall only be provided where access is required to a ventilation hatch or pedestrian link bridge.
12. A non-self-closing gate shall be provided on the platform at the top of the ladder or stairs. There shall be a landing of at least 600 mm x 900 mm at the top of the ladder/stairs, to permit the gate to be opened without the risk of falling.

### 3.10 Guardrails and Handrails

Guardrails and handrails shall be installed in accordance with AS 1657, except as varied herewith.

Handrails shall be connected to the vertical support posts based on fabrication materials.

Aluminium and steel handrails shall be connected to the posts in accordance with one of the following methods:

1. The top rail/handrail shall be fully enclosed within a cylindrical sleeve or ball type joint, which is then welded to the vertical support post/stanchions.
2. The top rail/handrail shall be welded directly to the vertical posts/stanchions.
3. Mounting of handrail on 'cradle' type brackets at each post is only acceptable if handrail is welded to cradle brackets or if approved structural blind fasteners (refer to clause 3.5) are used.

The handrail connection method shall allow for continuous hand movement along the top rail. Sleeving of the handrail at the post connections (although not strictly compliant with this requirement) is acceptable.

### 3.11 Pedestrian Link Bridge

Pedestrian Link Bridges are acceptable and shall be used where access to a group of tanks is being upgraded, the tanks are sited close to each other and it is considered the most cost effective option.

Pedestrian bridges shall be in accordance with the following:

1. The link bridge shall be located at or nearest to the point of closest proximity of the two tanks walls.
2. The link bridge spanning between the two tanks shall permit two way pedestrian traffic and comply with AS 1657. The bridge width shall be 1200 mm unless specified otherwise in the project specification.
3. The bridge structure shall be designed for 4.0 kPa live load.
4. Complying handrails shall be installed along both sides of the link bridge and for 2.0 m on each side of the bridge, along the tank wall.



## 3.12 Security

### 3.12.1 General

The final security equipment to be installed at each site shall be determined by a security risk assessment conducted by SA Water security and emergency management group.

SA Water have minimum security requirements that shall be provided at all tank installations in accordance with this clause. All optional requirements shall be determined using this security risk assessment.

Physical security shall be provided in accordance with TS 107.

Electronic Security Systems shall be provided in accordance with TS 106.

### 3.12.2 Requirements

#### 3.12.2.1 Minimum Requirements

The following security equipment shall be installed as a minimum:

1. A keyed security lock at each of the following locations:
  - a. Front security panel at the base of the ladder.
  - b. Security door at the lowermost landing on the stairs.
  - c. Sliding access hatch.
  - d. Sampling hatch.

The security locks shall be shrouded type for tanks holding filtered water, complying with the requirements of the SA Water Security group.

2. Cage access cover and plate (as per SA Water typical details on drawing 2009-31419-01, figure 17 of TS 107).
3. Reed switches and electronic security as per TS 106.

Landings shall be positioned in accordance with AS 1657. If lowest landing is less than 3 m above the ground surface, security mesh shall be installed around the landing support braces to limit unauthorised access and secure the tank.

#### 3.12.2.2 Optional Requirements

As determined by Security Risk Assessment.

### 3.12.3 Security Risk Assessment Process

The security risk assessment process may vary depending on the nature of the project delivery model (e.g. concept design by SAW, detailed design by Contractor, all design by Contractor, etc.). Irrespective of the delivery model, the detailed designer is responsible to ensure that the process described in this clause is (or has been) undertaken and the security design for the site is finalised and approved by SA Water prior to construction.

The security design shall be developed as follows:

- A security drawing (showing all equipment to be installed) of the site shall be prepared by designer and submitted to SA Water's Representative.
- SA Water will conduct the security risk assessment based on the security drawing provided.

- The outcomes of the security risk assessment will be documented by SA Water and submitted to the contractor by way of red pen mark-ups on the security drawing. These make ups will show the final security equipment required and locations of equipment to be installed.
- The Contractor shall:
  - Update the security drawings showing all security equipment identified in the security risk assessment and any other relevant information require for construction,
  - Submit the proposed security construction drawings to SA Water security for approval (via SA Water's Representative) prior to construction of security equipment.
  - Engage an SA Water authorised security contractor to install all security equipment.
  - Install the required equipment (as per the approved security drawing) in accordance with the drawings and SA Water security standards, refer to clause 10.4.
  - Update the construction drawing to include all "as built" details of all security equipment installed.
  - Provide the "as built" drawing to SA Water with all other As Built drawings for the project/site.

### 3.13 Miscellaneous

1. The opening in the roof shall be provided with an upstand, gutters, and flashing as necessary to:
  - a. allow mounting and opening of the sliding access hatch horizontally or at roof slope,
  - b. divert and drain rainwater to the tank edge without ponding, and
  - c. protect the opening in the roof from the ingress of foreign matter.
2. A manual davit shall be installed where specified in the project specification or identified during design for lifting equipment to the tank roof. The location of the davit shall be determined based on site conditions and shall be adjacent to the landing at the top of the ladder/stairs, on the hatch opening side, or an alternate location approved by SA Water's Representative.
3. Brackets for a diver's ladder shall be installed where specified in the project specification or when identified during design. The location of the diver's brackets shall be at the self-closing gate of the sampling hatch, or an alternate location approved by SA Water's Representative.
4. When not specified in the project specification, consideration should be given to providing bollards at the base of the stairs/ladder, to prevent accidental vehicle damage if deemed necessary at a site. Bollards shall only be installed when approved by SA Water's Representative.
5. A central anchor shall be provided as near as practicable to the centre of the roof for safety of personnel accessing the roof. The anchor shall comply with the requirements of AS/NZS 1891 and the associated connections to the tank roof framing shall be designed for the forces set out in this standard.
6. A 400 mm square inspection hatch shall be provided adjacent to the central anchor for the inspection of the anchor connections, if connections are below the roof sheeting.

## 4 Documentation

### 4.1 Design Drawings

Site-specific design drawings shall include the same information and level of detail shown on the typical drawings 5007-00001-01 to 5007-00001-16 as a minimum.

All drawings shall be produced in accordance with TS 95.