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Preface

This standard was prepared by the Access and Egress Development Group, overseen by the RISSB Rolling Stock Standing Committee.

Objective

The objective of this Standard is to describe the requirements for access and egress of workers and passengers on locomotives, freight, passenger, crew cars and infrastructure maintenance (track machines) rolling stock.

The main purpose of the requirements is to provide safe, efficient, equitable and dignified access and egress, and to minimize risks to passengers and workers associated with access and egress, emergency evacuations, and requirements for people with disabilities.

Compliance

There are four types of provisions contained within Australian Standards developed by RISSB:

- (a) Requirements.
- (b) Recommendations.
- (c) Permissions.
- (d) Constraints.

Requirements – it is mandatory to follow all requirements to claim full compliance with the Standard. Requirements are identified within the text by the term ‘shall’.

Recommendations – do not mention or exclude other possibilities but do offer the one that is preferred.

Recommendations are identified within the text by the term ‘should’.

Recommendations recognize that there could be limitations to the universal application of the control, i.e. the identified control is not able to be applied or other controls are more appropriate or better.

Permissions – conveys consent by providing an allowable option. Permissions are identified within the text by the term ‘may’.

Constraints – provided by an external source such as legislation. Constraints are identified within the text by the term ‘must’.

For compliance purposes, where a recommended control is not applied as written in the standard it could be incumbent on the adopter of the standard to demonstrate their actual method of controlling the risk as part of their WHS or Rail Safety National Law obligations. Similarly, it could also be incumbent on an adopter of the standard to demonstrate their method of controlling the risk to contracting entities or interfacing organisations where the risk may be shared.

RISSB Standards address known hazards within the railway industry. Hazards, and clauses within this Standard that address those hazards, are listed in Appendix B.

Appendices in RISSB Standards may be designated either “normative” or “informative”. A “normative” appendix is an integral part of a Standard and compliance with it is a requirement, whereas an “informative” appendix is only for information and guidance.

Commentary

Commentary *C Preface*

This Standard includes a commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by 'C' preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the Standard.

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Section 1 Scope and general

1.1 Scope

This Standard covers access and egress by passengers and workers on access paths for passengers or access ways for workers and their access devices. This includes the design, construction and maintenance of locomotive, freight, passenger, crew cars and infrastructure maintenance rolling stock.

This Standard applies to new and modified locomotives, freight, passenger, crew cars and infrastructure maintenance rolling stock. Existing rollingstock should be assessed and modified to meet the requirements of this Standard where practical to do so.

This Standard does not cover:

- (a) road-rail vehicles;
- (b) operation of rolling stock in regard to network safeworking rules and route standards; or
- (c) maintenance and operational access to vehicle components by manholes, hatches, service openings, etc or for access by part of the human body.

This Standard is not specifically intended to cover rolling stock used on cane railways, but items from this Standard may be applied to such systems as deemed appropriate by the relevant railway infrastructure manager (RIM).

This Standard is intended to complement the Australian Government Disability Standards for Accessible Public Transport Guidelines (DSAPT) rather than interpret or supersede any requirements of the DSAPT. Compliance with the Standard does not indicate that requirements under the DSAPT have been met. When adopting this Standard, the user should be aware that the DSAPT could be altered without notice and therefore this Standard provides only high-level references to the DSAPT.

1.2 Normative references

The following documents are referred to in the text in such a way that *some* or all of their content constitutes requirements of this document:

- AS 1428.1, *Design for access and mobility, Part 1: General requirements for access - New building work*
- AS 1428.2, *Design for access and mobility, Part 2: Enhanced and additional requirements — Buildings and facilities*
- AS 1657, *Fixed platforms, walkways, stairways and ladders — Design, construction and installation*
- AS 1735.12, *Lifts, escalators and moving walks, Part 12: Facilities for persons with disabilities (EN 81-70:2018, MOD)*
- AS 1892.2, *Portable ladders, Part 2: Timber*
- AS 7470, *Human Factors Integration and Technical Requirements for Rail Engineering Projects*
- AS 7489, *Rolling Stock Passenger and Seating Appointments*
- AS 7507, *Rolling Stock Outlines*
- AS 7513, *Interior environment*
- AS 7520.1, *Australian railway rolling stock — Body structural requirements, Part 1: Locomotive*
- AS 7520.3, *Australian Railway Rolling Stock — Body Structural Requirements, Part 3: Passenger Rolling Stock*

- AS 7520.4, *Body structural requirement, Part 4 – Infrastructure maintenance*
- AS 7528, *Internal communications*
- AS 7529.1, *Australian Railway Rolling Stock – Fire Safety, Part 1: Locomotive*
- AS 7529.3, *Australian Railway Rolling Stock – Fire Safety, Part 3: Passenger*
- AS 7529.4, *Australian Railway Rolling Stock – Fire Safety, Part 4: Track Machines*
- AS 7531, *Rolling stock lighting and visibility*
- AS 7633, *Railway infrastructure: Clearances*
- AS/NZS 1891, *Industrial fall-arrest systems and devices*
- AS/NZS 3661.2, *Slip resistance of pedestrian surfaces, Part 2: Guide to the reduction of slip hazards*
- AS/NZS 3856.1, *Hoists and ramps for people with disabilities - Vehicle mounted, Part 1: Product requirements*
- AS/NZS 4586, *Slip resistance classification of new pedestrian surface materials*
- ISO 2867, *Earth-moving machinery - Access systems*
- ISO 14122-2, *Safety of machinery - Permanent means of access to machinery - Part 2: Working platforms and walkways*
- ISO 14122-3, *Safety of machinery - Permanent means of access to machinery - Part 3: Stairs, stepladders and guard-rails*
- EN 14752, *Railway applications - Bodyside entrance systems for rolling stock*
- Australian Government Disability Standards for Accessible Public Transport Guidelines (DSAPT)
- iMOVE 6-002, *Australian Size Variation for Design, M004: Detailed anthropometry dataset V2.0 30/06/2023*
- US Code of Federal Regulations 49 CFR 238.441, *Transportation – Passenger equipment safety standards – Emergency roof entrance location*

NOTE:

Documents for informative purposes are listed in a Bibliography at the back of the Standard.

1.3 Defined terms and abbreviations

For the purposes of this document, the following terms and definitions apply:

1.3.1

access way restraint

grabrail, guardrail, handhold or handrail provided on an access path or access way

1.3.2

access way

walkway, corridor, aisleway or ramp etc on rolling stock, that complies with WHS requirements for workers use

1.3.3

basic platform access

the limits for platform gaps for passenger access where the existing platform layouts cannot be altered

1.3.4**cab**

part of the vehicle accessible only to the authorized persons that consists of controls for the vehicle operation

1.3.5**closed**

door leaf or leaves have sealed the doorway and the door(s) can be locked without further movement of the door leaves

1.3.6**crew**

on-board rail safety workers which includes drivers, guards, buffet crew and sleeping car attendants that carry out roles to ensure the safe operation of the train on the railway system

1.3.7**crew areas**

space within a vehicle, or a complete vehicle allocated to the crew for work, rest or access path that leads to the allocated areas

1.3.8**crew car**

hauled vehicle utilized for the transport of workers in trains. Also known as 'relay car' and includes 'rail test car'

1.3.9**crew door**

any door which is primarily designed for use by the crew of a train for personal access

1.3.10**DSAPT**

abbreviation used in this document for the Disability Standards for Accessible Public Transport 2002 and Amendments which states requirements for transport providers and operators to meet the Disability Discrimination Act

1.3.11**doorway**

opening in the vehicle body allowing workers or passengers to walk through

1.3.12**emergency access device**

mechanism that is operable by persons outside the vehicle to unlock and open a local door

1.3.13**emergency egress device**

mechanism that is operable by passengers or traincrew inside the vehicle to unlock and open a local door

1.3.14**enabled**

door leaf or leaves are in the closed or open position and are available for use by passengers. The door can be manually operated, or the door system can respond to inputs for opening or closing commands from passenger-operated controls

1.3.15**exterior door**

door that provides access or egress between the interior and exterior of the rollingstock

1.3.16**fixed access device**

step, stair, ladder, or ramp

1.3.17**ground access device**

access device that is placed on the level equal with the top of railway track sleepers

1.3.18**ground level**

level equal with the top of railway track sleepers

1.3.19**ground level access**

access from a level equal with the top of railway track sleepers

1.3.20**ground level access point**

access point on a level equal with top of railway track sleepers

1.3.21**hoist**

mechanically operated platform used to raise and lower passengers into and out of a vehicle

1.3.22**improved platform access**

limits for platform gaps for passenger access where the platform layouts can be altered if necessary and boarding devices can be used where necessary

1.3.23**internal door**

door that does not provide access or egress to the exterior of the rolling stock, such as an inter-car door or cab bulkhead door

1.3.24**lift**

compartment or platform that mechanically raises or lowers passengers

1.3.25**locked**

passenger door leaves are in the closed position and have been fixed in position by mechanical and/or electrical devices. Passengers cannot use the passenger-operated controls to control the doors. Passengers or external persons can open the doors using an emergency egress device or emergency access device unless the doors are locked out of use or a speed sensitive lock has been activated. Worker doors are locked and only accessible using a key or special tool

1.3.26**locked out of use**

passenger door leaves have been fixed in the closed position. The passenger controls have been disabled, and operation of the emergency egress device or emergency access device is not effective

1.3.27**local**

close or adjacent to a doorway and limited to control only one or a limited number of doors

1.3.28**open**

door leaves are partially or fully moved from the closed position, creating an opening

1.3.29**passenger**

person travelling on rolling stock who is not a worker

1.3.30**platform gap**

the vertical and/or horizontal distance from the upper, outer edge of the treadplate to the upper, outer edge of the platform (cope) (see Appendix Figure A.1)

1.3.31**platform step proportion**

parameter related to the size of the platform gap, calculated as per Appendix Equation A.1

1.3.32**portable ladders**

ladder carried on the vehicle, which is stowed at a separate location, manually assembled, and secured against the vehicle for access and/or egress

1.3.33**positive latching system**

system that can provide a confirmation that the latching or the action of the lock is definitely achieved or completed

1.3.34**ramp**

fixture or portable device on an access way that provides a sloping surface giving access from one level to another

1.3.35**released**

door that has been made available for operation by passengers

1.3.36**remote regional area**

rural area where the time taken for emergency services to reach a railway accident could exceed one hour

1.3.37**retractable ladder**

ladder fixed in location on the vehicle and deployed from a retracted and stowed position automatically or manually

1.3.38**riser**

vertical surface between treads on a stairway

1.3.39**rung**

horizontal climbing element of a ladder

1.3.40**rung ladder**

ladder consisting of rungs and stiles

1.3.41**stairs**

series of rising steps with one or more adjacent handrails used for walking between levels

1.3.42**steps**

grabrail, guardrail, handhold or handrail provided on an access path or access way

1.3.43**stile**

vertical members either side of the rungs of a rung ladder

1.3.44**tread**

horizontal surface on a step

1.3.45**ultimate platform access**

limits for platform gaps for passenger access where the platform layouts can be altered if necessary and where boarding devices will not be required

1.3.46**vertical access device**

means of access between two levels

1.3.47**worker door**

any door which is primarily designed for use by any worker of the railway company for personal access. These doors are not maintenance and operational access hatches

General rail industry terms and definitions are maintained in the RISSB Glossary. Refer to:

<https://www.rissb.com.au/glossary/>

Section 2 Doors

2.1 General

2.1.1 Door drainage

Drainage of doorways shall be provided.

Commentary C.2.1

Examples of drainage methods are roof drains, lintel gutters, and door sill drains.

2.1.2 Locomotive rolling stock

Doors shall be fitted at all doorways or access openings to the exterior unless fitted with a guardrail, gate, or barrier.

Commentary C.2.1.1

This requirement is relevant to openings from the vehicle body and not to openings provided for shunters to stand on the vehicle close to ground level.

At least one doorway or access opening shall be fitted on each side of each vehicle.

2.1.3 Freight rolling stock

Hinged doors or sliding doors that are not self-closing should be able to be latched fully open.

All exterior access doors should be able to be locked from the outside and designed to eliminate unintended or malicious opening.

Access doors to air-tight compartments shall be able to be unlocked from the interior without a key or special tool.

2.1.4 Passenger rolling stock and crew cars

At least one doorway or access opening shall be fitted on each side of each vehicle.

Doors shall be fitted at all doorways or access openings to the exterior unless fitted with a guardrail, gate or barrier noting that the use of guardrails, gates or barriers at passenger doorways are restricted to heritage and heritage style vehicles where specific risk controls have been adopted.

Commentary C.2.1.3

This requirement is relevant to openings from the vehicle body and not to openings provided for shunters to stand on the vehicle close to ground level.

Doorways should prevent rainwater runoff from the vehicle exterior falling across the door portal and entering the interior.

The number and arrangement of emergency egress routes shall be derived from the fire safety assessment of the vehicle in accordance with AS 7529.

Doorways should be provided for access between adjoining crew and passenger areas.

2.1.5 Infrastructure maintenance rolling stock

Doors shall be fitted at all doorways or access openings to the exterior unless fitted with a guardrail, gate, or barrier.

Commentary C.2.1.4

This requirement is relevant to openings from the vehicle body and not to openings provided for shunters to stand on the vehicle close to ground level.

At least one doorway or access opening shall be fitted on each side of each vehicle.

2.2 Doorway widths and heights

2.2.1 Locomotive rolling stock

Worker access doorways on locomotive rolling stock should be at least 450 mm wide and 1,887 mm high.

2.2.2 Freight rolling stock

Worker access doorways (if fitted) on freight rolling stock should be at least 450 mm wide and 1,887 mm high.

2.2.3 Passenger rolling stock and crew cars

Doorway widths and heights shall be sized using anthropometric dimensions defined in the NHS detailed anthropometry – adults 18-64 years old data as shown in iMOVE 6-002 – Australian Size Variation for Design – M004: Detailed anthropometry dataset – V2.0 – 30/06/2023, based on at least the P95 (95th percentile) male dimensions, where actual representative population anthropometric data is not available.

Worker doorway widths should allow for luggage or equipment regularly carried or stored in cabs or crew areas, and where required, for emergency evacuation of crew and passengers.

Commentary C.2.2.3-1

Toolbox/luggage maximum size is typically 600 mm long × 600 mm high × 300 mm wide.

Doorway widths on passenger rolling stock should be proven acceptable with physical trials or passenger flow software simulations for passenger loading scenarios including emergency evacuation.

Commentary C.2.2.3-2

By modelling expected passenger flow with software simulations, specific parameters such as door dimensions and other restraints such as step height can be assessed to assist with the optimisation of passenger flow.

Passenger access doorways on passenger rolling stock should have at least a 1,900 mm clear height and should be at least 850 mm wide.

Commentary C.2.2.3-3

This is to align with DSAPT requirements.

Worker access doorways on passenger rolling stock and crew cars should be at least 660 mm wide where also used for passenger emergency evacuation, else should be at least 450 mm wide.

Worker access doorways on passenger rolling stock and crew cars should be at least 1,887 mm high.

2.2.4 Infrastructure maintenance rolling stock

Worker access doorways on infrastructure rolling stock should be at least 450 mm wide and 1,887 mm high for entry into a stand-up compartment.

2.3 Door structure

2.3.1 Door structure – freight rolling stock

There are no requirements in Section 2.3.1 applicable to freight rolling stock.

2.3.2 Door structure – locomotive, passenger, and infrastructure maintenance rolling stock

Door strength requirements shall be derived in accordance with AS 7520.

Any fire resistance requirements for doors shall be derived from the fire safety assessment of the vehicle in accordance with AS 7529.

Any noise and thermal insulation requirements for doors shall be derived from assessments for meeting the required interior noise and temperature levels in accordance with AS 7513.

2.4 Treadplates

2.4.1 General

Locomotive rolling stock, passenger rolling stock and crew cars and infrastructure maintenance rolling stock, treadplates:

- (a) should be slip resistant in all horizontal directions when tested using AS/NZS 4586 with a suitable classification as determined by the RTO; and
- (b) where fitted at exterior doors should have rounded ends, radiused edges and lips.

Commentary C.2.4.1-1

To reduce impact injuries from slip, trip, fall and contact with the moving vehicle.

For passenger rolling stock, treadplates should avoid having holes or slots between 7 mm and 15 mm width.

Commentary C.2.4.1-2

To avoid trapping stiletto heels.

2.4.2 Platform gaps

Commentary C.2.4.2

Rolling stock alone cannot explicitly manage platform gaps (i.e. the platform door interface), as coordination with infrastructure and interface Standards and stakeholders will be required. Refer to AS 7507 and AS 7633 for additional information.

Section 2.4.2 of this Standard only specifies requirements for locomotive and passenger rolling stock and crew cars, where this rolling stock can influence the overall platform gap and assist with meeting the desired operational outcome. Section 2.4.2 does not contain any requirements specific to freight or infrastructure maintenance rolling stock.

Appendix A provides detailed supplementary information, which describes how platform gaps are measured and classified.

2.4.2.1 Platform gaps – locomotive and passenger rolling stock and crew cars

The edge of the door sills shall utilize the maximum extent of the available static outline limit.

To minimize the gap at accessible doors, active components such as extendable treadplates/steps or active suspension components should be used.

2.4.3 Treadplate structures

2.4.3.1 Locomotive rolling stock

Fixed treadplates at exterior doors on locomotive rolling stock should extend the full width of the doorway.

The outer edge of each treadplate on locomotive rolling stock should have a warning strip with:

- (a) minimum luminance contrast of 30% to the adjacent floor;
- (b) the strip having a horizontal surface width of 50 mm to 75 mm;
- (c) the strip having a vertical surface of luminance contrast of 30% and width of not more than 10 mm.

A treadplate on locomotive rolling stock shall withstand without permanent deformation a minimum vertical force of 2 kN anywhere on its top surface acting either on a circular area of 125 mm diameter or a rectangular area of 100 mm × 200 mm.

2.4.3.2 Freight rolling stock

Freight rolling stock treadplates should be slip resistant to at least Classification R10 in all horizontal directions when tested using AS/NZS 4586.

The outer edge of each treadplate on freight rolling stock should have a warning strip with:

- (a) minimum luminance contrast of 30% to the adjacent floor;
- (b) the strip having a horizontal surface with width of 50 mm to 75 mm; and
- (c) the strip having a vertical surface with width of 20 mm to 50 mm.

2.4.3.3 Passenger rolling stock and crew cars

Fixed treadplates at exterior doors on passenger rolling stock and crew cars should extend at least the full width of the doorway.

The outer edge of each treadplate on passenger rolling stock and crew cars should have a warning strip with:

- (a) minimum luminance contrast of 30% to the adjacent floor;
- (b) the strip having a horizontal surface with width of 50 mm to 75 mm; and
- (c) the strip having a vertical surface of luminance contrast of 30% and width of not more than 10 mm.

A treadplate on passenger rolling stock and crew cars shall withstand without permanent deformation a minimum vertical force of 2 kN anywhere on its top surface acting on either a circular area of 125 mm diameter or a rectangular area of 100 mm × 200 mm.

A treadplate on passenger rolling stock and crew cars shall withstand without permanent deformation a uniformly distributed vertical load of 4 kN/m.

Moving treadplates on passenger rolling stock and crew cars shall be designed to be locked in the folded or retracted position when the vehicle is in motion, under power or being towed.

Moving treadplates on passenger rolling stock and crew cars shall be interlocked with the train, so the train is held stationary when the stairs are not locked in the folded or retracted position.

Moving treadplates on passenger rolling stock and crew cars shall be designed so as to cease movement and/or not retract or extend when exposed to a vertical force equal to or greater than 150 N applied over an area of 40 mm in diameter anywhere on the treadplate surface likely to be stood on by a person.

Commentary C.2.4.3.3

To prevent movement whilst occupied by a person.

Operators shall have means to manually extend, retract and lock the moving treadplates on passenger rolling stock and crew cars.

2.4.3.4 Infrastructure maintenance rolling stock

Fixed treadplates at exterior doors on infrastructure maintenance rolling stock should extend the full width of the doorway.

The outer edge of each treadplate on infrastructure maintenance rolling stock should have a warning strip with:

- (a) minimum luminance contrast of 30% to the adjacent floor;
- (b) the strip having a horizontal surface with width of 50 mm to 75 mm;
- (c) the strip having a vertical surface of luminance contrast of 30% and width of not more than 10 mm.

A treadplate on infrastructure maintenance rolling stock shall withstand without permanent deformation a minimum vertical force of 2 kN anywhere on its top surface acting either on a circular area of 125 mm diameter or a rectangular area of 100 mm × 200 mm.

2.5 Door controls and forces

2.5.1 Door controls and forces - general

There are no requirements in Section 2.5 applicable to freight rolling stock.

2.5.2 Door controls and forces – crew doors

Crew door controls and unlocking devices (where fitted) should be operable from the interior and exterior sides of the door.

Exterior controls for worker doors which can be accessed directly via ladders should allow the door to be operated from ground level and at platforms.

Commentary C.2.5.2

Not applicable to doors accessible via a catwalk, for example.

Duplication of exterior door controls could be necessary to achieve 2.5.2

The force required to operate a crew door control should not exceed 100 N.

2.5.3 Door controls and forces - passenger door controls

The force required to operate a passenger door control shall not exceed 19.5 N.

Door controls on passenger doors, should be able to be enabled by crew to allow individual operation by passengers or crew.

Door controls for power-assisted doors shall not require passengers to grip or twist controls in order to operate opening devices, in accordance with the requirements of DSAPT.

2.6 Manual doors

2.6.1 Locomotive rolling stock

Doors shall comply with the requirements of AS 7520.1.

Hinged doors or sliding doors that open within the vehicle rolling stock outline and that are not self-closing should be able to be latched fully open and designed to eliminate unintended or malicious opening.

If the swing envelope of exterior hinged doors or sliding doors on locomotive rolling stock exceeds the required rolling stock outline, a secondary locking mechanism shall be provided to prevent a single point failure mode.

Commentary C.2.6.1

Refer to AS 7507 for details on Rolling Stock Outlines.

2.6.2 Freight rolling stock

Exterior hinged doors or sliding doors on the sides of freight rolling stock should remain within the required rolling stock outline when the doors are opened.

If the swing envelope of exterior hinged doors or sliding doors on freight rolling stock exceeds the required rolling stock outline, a secondary locking mechanism shall be provided to prevent a single point failure mode.

Commentary C.2.6.2

If the opened exterior hinged doors or sliding doors are outside the required rolling stock outline, the vehicle could be fitted with an interlock system to prevent unsafe operation.

Refer to AS 7507 for details on rolling stock outlines.

2.6.3 Passenger rolling stock and crew cars

Doors shall comply with the requirements of AS 7520.3.

Hinged doors or sliding doors that open within the vehicle rolling stock outline and that are not self-closing should be able to be latched fully open and designed to eliminate unintended or malicious opening.

Exterior hinged doors or sliding doors on passenger rolling stock and crew cars shall only be permitted to swing outwards if the door swing envelope remains within the conditions defined in AS 7507.

Manual sliding doors on passenger rolling stock and crew cars should comply with the maximum closing force(s) prescribed in EN 14752 when subjected to the maximum expected in-service horizontal accelerations occurring in line with the door leaf.

Manual exterior doors with central locking shall be fitted with an interlock to prevent movement of a train when one or more exterior passenger doors are open.

Commentary C.2.6.3-1

The interlock could be overridden when there is a faulty door by isolating the faulty door from the interlock system and if that failed, isolating the complete interlock system (of the train).

Manual doors with central locking shall have an emergency door release device.

The emergency egress devices shall be interlocked with train speed detection so that the doors cannot be opened when the train is moving.

Manual doors and their surrounds shall be designed to minimize the risk of trapping and catching hands or limbs by exposed door mechanisms or in the interface between the moving door leaf and the surrounds.

Commentary C.2.6.3-2

Entrapment hazards can be minimized by using guards and minimizing open gaps.

2.6.4 Infrastructure maintenance rolling stock

Doors shall comply with the requirements of AS 7520.4.

Hinged doors or sliding doors that open within the vehicle rolling stock outline and that are not self-closing should be able to be latched fully open.

If the swing envelope of exterior hinged doors or sliding doors on infrastructure maintenance rolling stock exceeds the required rolling stock outline, a secondary locking mechanism shall be provided to prevent a single point failure mode.

Commentary C.2.6.4

If the opened exterior hinged doors or sliding doors are outside the required rolling stock outline, the vehicle could be fitted with an interlock system to prevent unsafe operation.

Refer to AS 7507 for details on rolling stock outlines.

2.7 Powered doors

NOTE:

There are no requirements in Section 2.7 applicable to locomotive or freight rolling stock.

2.7.1 General requirements

Human factors requirements for alarms and alerts shall be in accordance with AS 7470.

2.7.2 Passenger rolling stock and crew cars

Powered exterior doors shall have an obstruction detection system which reopens the doors if a person or object is trapped or caught in the doorway.

Powered interior doors should have an obstruction detection system which reopens the doors if a person or object is trapped or caught in the doorway.

Commentary C.2.7.2-1

Sensitive edges, force detection, optical, infra-red, distance or motion sensors are all possible solutions for obstruction detection systems. Solutions provided for a particular doorway type could be comprised of several methods. For example, a powered door with a plugging motion could require separate obstruction detection methods for the sliding and the plugging motions.

Obstacle detection functionality shall be in accordance with EN 14752. For plug doors this functionality shall include the plugging functionality of the door.

Commentary C.2.7.2-2

Test objects could need to be adapted to accommodate the testing of plug doors.

Powered doors and their surrounds shall be designed to avoid trapping and catching hands or limbs by exposed door mechanisms or in the interface between the moving door leaf and the surrounds.

Commentary C.2.7.2-3

Entrapment hazards can be minimized by using guards and minimizing open gaps.

Powered doors should be fitted with flexible nosing or cushioning that, when closed, will allow the withdrawal of objects in accordance with EN 14752.

Commentary C.2.7.2-4

The intent is to reduce impact forces if the obstruction detection system fails and to allow thin trapped objects to be withdrawn if doors have locked.

EN 14752 provides requirements for obstacle removal force which includes the test method and the specification of test object

Powered exterior passenger doors shall be fitted with a warning system to provide visual and audio alarm or message both internally and externally prior to the door closing.

Powered exterior passenger doors that open automatically shall be fitted with a warning system to provide an internal visual and audio alarm or message prior to the door opening.

Powered exterior passenger doors that are fitted with passenger door controls shall be fitted with both an internal and external visual and audio alarm or message to advise passengers that the doors can be opened.

Commentary C.2.7.2-5

Careful consideration of consistency in the design and operation of the passenger door controls throughout the train will optimize the usability of the systems for all passengers. Where it is not practical to achieve this consistency in its entirety, consultation with key stakeholders for example public transport accessibility groups can assist with identifying potential solutions. Further information regarding the general requirements for human factors integration in engineering design is given in AS 7470.

The maximum closing force(s) of powered door leaves on passenger rolling stock and crew cars should be as per EN 14752.

The maximum opening force(s) of powered door leaves, after the emergency release has been activated, on passenger rolling stock and crew cars should comply with EN 14752.

Passenger doors with automatic closing, where there is no step, should allow the door to remain open for a period of at least 6 seconds after provision of the visual and audio warning.

Commentary C.2.7.2-6

This refers to auto closing of doors where there is no crew action.

Powered exterior doors shall not allow door to open unless the train is held stationary by the train braking system.

Commentary C.2.7.2-7

The intent of this is to ensure that the train is held stationary by using the most accurate source of information available to indicate 0 km/h. For example, relying on a set brake cylinder pressure alone to indicate the train is stationary could potentially lead to train movement due to variations with track grade/condition, brake degradation or vehicle loading.

When powered exterior doors excluding cab or crew doors are open or a door release has been applied, the train braking system shall hold the train stationary until all doors are confirmed closed and locked.

2.7.3 Infrastructure maintenance rolling stock

Powered exterior doors shall have an obstruction detection system which reopens the doors if a person or object is trapped or caught in the doorway.

Commentary C.2.7.3-1

Sensitive edges, force detection, optical, infra-red, distance or motion sensors are all possible solutions for obstruction detection systems. Solutions provided for a particular doorway type could be comprised of several methods. For example, a powered door with a plugging motion could require separate obstruction detection methods for the sliding and the plugging motions.

Door obstruction detection can be checked with the test objects as described in EN 14752.

Powered doors and their surrounds shall be designed to avoid trapping and catching hands or limbs by exposed door mechanisms or in the interface between the moving door leaf and the surrounds.

Commentary C.2.7.3-2

Entrapment hazards can be minimized by using guards and minimizing open gaps.

Powered doors should be fitted with flexible nosing or cushioning that, when closed, will allow the withdrawal of objects up to 10 mm × 50 mm with a maximum force of 150 N.

Commentary C.2.7.3-3

To reduce impact forces if the obstruction detection system fails and to allow thin trapped objects to be withdrawn if doors have locked.

The maximum closing force(s) of powered door leaves should be as per EN 14752.

The maximum opening force(s) of powered door leaves, after the emergency release has been activated, on rolling stock should comply with EN 14752.

Powered exterior doors shall not allow door to open unless the train is held stationary by the train braking system.

When powered exterior doors excluding cab or crew doors are open or a door release has been applied, the train braking system shall hold the train stationary until all doors are confirmed closed and locked.

2.8 Door locking

NOTE:

There are no requirements in Section 2.8 that are applicable to freight rolling stock.

2.8.1 Locomotive rolling stock

Exterior crew doors should be able to be locked and unlocked by workers from both sides of each door.

Exterior crew doors should be able to be unlocked from the interior without a key or other security device.

Exterior crew doors which can be accessed directly via ladders should be able to be unlocked from both platform level and ground level.

All exterior crew doors on locomotive rolling stock shall be able to be mechanically locked when out of service or stabled.

2.8.2 Passenger rolling stock and crew cars

Except for heritage rolling stock, all exterior passenger doors that have not been locked should be identifiable to the train crew without requiring individual physical testing.

Commentary C.2.8.2-1

Identification of the door locked and locked out of use status could be achieved by local or remote indication.

Exterior doors should be able to be locked or locked out of use and unlocked by workers.

Exterior crew doors should be able to be unlocked from the interior without a key or other security device.

Exterior crew doors which can be accessed directly via ladders should be able to be unlocked from both platform level and ground level.

Powered doors on rolling stock should be locked when closed and able to be locked out of use from a location readily accessible to crew.

Powered passenger doors on rolling stock should be locked when closed and able to be opened or enabled for local operation from a location on the train readily accessible to crew.

Powered passenger doors on rolling stock shall remain locked in the event of a loss of power.

Commentary C.2.8.2-2

For emergency door release, see Section 6.4.2.

All doors on rolling stock should be able to be mechanically locked when out of service or when stabled.

Except for crew cars, all exterior passenger doors on rolling stock shall be fitted with traction interlock to prevent tractive effort being applied on a stationary train when one or more exterior passenger doors are open.

Powered exterior passenger doors on rolling stock shall have a positive latching system to prevent doors being opened whilst the train is in motion.

Inter-car doors shall not be lockable unless an emergency release device is available.

Any cab transverse doors fitted between cabs and passenger compartments on rolling stock should have a rapid exit door release device on the cab side of the door.

All exterior passenger doors on rolling stock should be fitted with an anti-drag system in accordance with EN 14752.

2.8.3 Infrastructure maintenance rolling stock

All exterior worker doors should be able to be Locked.

Exterior worker doors should be able to be unlocked from the interior without a key or other security device.

Exterior worker doors which can be accessed directly via ladders should be able to be unlocked from both platform level and ground level.

All doors which are directly accessed from the outside on rolling stock shall be mechanically locked when out of service or for stabling.

2.9 Door status and signage

NOTE:

There are no requirements in Section 2.9 that are applicable to freight, locomotive, or infrastructure maintenance rolling stock.

Where passenger doors are unavailable for in-service use or emergency egress, this status shall be indicated visually on both sides of the door.

Commentary C.2.9

General requirements for signage are defined in AS 7528.

Temporary "Door locked" decals are a method of indicating passenger doors that are out of service.

Section 3 Windows

NOTE:

There are no requirements in Section 3 that are applicable to freight rolling stock.

3.1 Locomotive rolling stock

Structural requirements for locomotive rolling stock windows and glazing shall be determined in accordance with AS 7520.1.

Windows in exterior doors on locomotive rolling stock should allow viewing of the exterior including an adjacent platform surface and exterior platform signage.

Windows in interior hinged doors on locomotive rolling stock should allow viewing of the area around the door swept path.

3.2 Passenger rolling stock and crew cars

Structural requirements for passenger rolling stock and crew cars windows and glazing shall be determined in accordance with AS 7520.3.

Windows in exterior doors on passenger rolling stock and crew cars should allow viewing of the exterior including an adjacent platform surface and exterior platform signage.

Windows in interior hinged doors on passenger rolling stock and crew cars should allow viewing of the area around the door swept path.

Glazing in doors, sidelights, weather shields, and any glazing with unobstructed access capable of being mistaken for a doorway or opening shall be clearly marked with a full width of not less than 75 mm wide solid contrasting line at a height between 900 mm and 1,000 mm above the plane of the finished floor.

The line on the glazing shall provide a minimum of 30% luminance contrast when viewed against the floor surface or surfaces within 2 m of the glazing on the opposite side.

3.3 Infrastructure maintenance rolling stock

Structural requirements for infrastructure maintenance rolling stock windows and glazing shall be determined in accordance with AS 7520.4.

Windows in exterior doors on infrastructure maintenance rolling stock should allow viewing of the exterior including an adjacent platform surface and exterior platform signage.

Windows in interior hinged doors on infrastructure maintenance rolling stock should allow viewing of the area around the door swept path.

Section 4 Vertical access devices

4.1 General requirements

Fixed access devices on rolling stock should be in accordance with AS 1657, ISO 2867 or ISO 14122, subject to any supplementary requirements given in Sections 4.2 to 4.5.

Commentary C.4.1-1

The scope of these Standards includes mobile machinery, and whilst their individual requirements for specific aspects could differ, they are still considered suitable for rolling stock.

There shall be a means of ground level access fitted to both sides of locomotive rolling stock, passenger rolling stock and crew cars and Infrastructure maintenance rolling stock.

The number and arrangement of ground level access routes should be derived from the fire safety assessment of the vehicle in accordance with AS 7529 and should include vehicles semi-permanently coupled into units and also individual vehicles made up into trains.

Where passenger rolling stock and crew cars are operating through long single-track tunnels that prevent side egress, there should be a means of ground level access fitted to at least one end of a passenger train or crew car.

Vertical access devices shall not provide exterior access above the floor level of vehicles unless controls are provided to mitigate against the risks created by any overhead hazards.

Commentary C.4.1-3

EN 50122 provides information regarding prescribed minimum electrical clearances considering:

- equipment/system voltage,
- a definition of a standing surface.

When utilising international standards, the definitions for terms such as high voltage and low voltage can vary from the definitions commonly used in the Australia context (i.e. as derived from AS 3000).

4.2 Steps

Step lighting requirements shall be determined in accordance with AS 7531.

Commentary C.4.2-1

A single step from vehicle to platform is defined here as a treadplate.

The outer edge of each tread on a step ladder or stairs should have a warning strip with:

- (a) minimum luminance contrast of 30% to the rest of the tread;
- (b) a strip on horizontal surface with width of 50 mm to 75 mm;
- (c) a strip on vertical surface of luminance contrast of 30% and width of not more than 10 mm.

Rungs on a rung ladder should be of a minimum luminance contrast of 30% to the surrounding structures.

The tread surface of the lowest step for ground access devices shall be no more than 500 mm above rail level.

Commentary C.4.2-2

Based on maximum 700 mm above ground in ISO 2867.

For infrastructure maintenance rolling stock with removable steps, a securable storage area shall be provided for steps when not in use.

The tread surface of the lowest step for ground access devices on rolling stock should be no more than 200 mm above rail level or as low as possible within the required rolling stock outline.

Commentary C.4.2-3

Based on recommended 400 mm above ground in ISO 2867. Rolling stock outline could prevent achieving this.

The vertical clearance above a step on rolling stock shall be at least 150 mm.

Steps on rolling stock should be centrally located on any associated doorway centreline.

4.3 Stairs

NOTE:

There are no requirements in Section 4.3 for locomotive or freight rolling stock.

4.3.1 Stairs – passenger rolling stock

Deployable stairs on rolling stock shall be interlocked with the train, so the train is held stationary while the stairs are not stowed.

Deployable stairs on rolling stock shall be designed to be kept in the stowed position while the train is in motion, whether the train is under power or being towed and provide a means of manual release and return to be secured in the stowed position.

4.3.2 Stairs – infrastructure maintenance rolling stock

Stairs on rolling stock shall comply with ISO 2867.

Deployable stairs on rolling stock shall be interlocked with the train, so the train is held stationary while the stairs are not stowed.

4.4 Ladders

4.4.1 General requirements

Fixed ladders shall not provide exterior access above the floor level of vehicles unless controls are provided to mitigate against the risks created by any overhead hazards.

Commentary C.4.4.1

Typical controls include:

- screens or physical barriers are provided for any overhead hazards, or
- locked barriers are fitted with access only by authorized trained workers.

To optimize the ladder location (relative to track centreline, side sill, bogies, equipment etc) can require the integration of access systems into the body structure design as a primary design aim.

Handrails are permitted with rung ladders. This is common practice on rolling stock and allowed by ISO 2867. Negates clause 5.6.8 of AS 1657.

Backwards inclined ladders should not be fitted on passenger or freight rolling stock.

Ladder incline should be constant along its length on rolling stock.

Permanently positioned attachments should not overhang ladders in such a way to impinge on the required space of a 95th percentile male to 5th percentile female crew member in climbing the ladder.

4.4.2 Fixed ladders – locomotive, passenger, and infrastructure maintenance rolling stock

NOTE

There are no requirements in Section 4.4.2 for freight rolling stock.

Retractable exterior ladders shall be designed so that the vehicle is held stationary while the retractable ladders are not stowed.

Retractable exterior ladders shall be designed to be kept in the stowed position while the vehicle is in motion, whether the vehicle is under power or being towed and regardless of the status of the vehicles' electrical, pneumatic, or hydraulic systems.

Where the retractable ladder is part of an access path and the normal power source is not available on a stabled vehicle, retractable exterior ladders shall be able to be deployed by alternative means.

Exterior ladders on passenger rolling stock shall only be used by passengers for emergency egress:

- (a) from rolling stock to ground level, and
- (b) emergency access onto other rolling stock.

Where backwards inclined ladders are fitted on locomotive or infrastructure maintenance rolling stock. They shall meet the requirements of ISO 2867, Table 5, Retracted Step.

Fixtures such as the underframe or treadplate should not protrude past the climbing face of a ladder.

4.4.3 Portable ladders

Commentary C.4.4.3-1

There are no requirements in Section 4.4.3 for locomotive or freight rolling stock.

Emergency ladders are covered under Section 6.

Interior portable ladders should not be used for passengers.

Commentary C.4.4.3-2

For example, sleep bunk access.

Interior portable ladders shall comply with AS 1892.2 for duty rating of industrial.

An area should be provided for secure storage of portable or removable ladders.

4.5 Access device surfaces

Vertical barriers shall be fitted at the ends of rungs and treads.

Commentary C.4.5-1

To prevent feet slipping off.

Figure 1 provides an example of how vertical barriers are to be fitted on rungs.

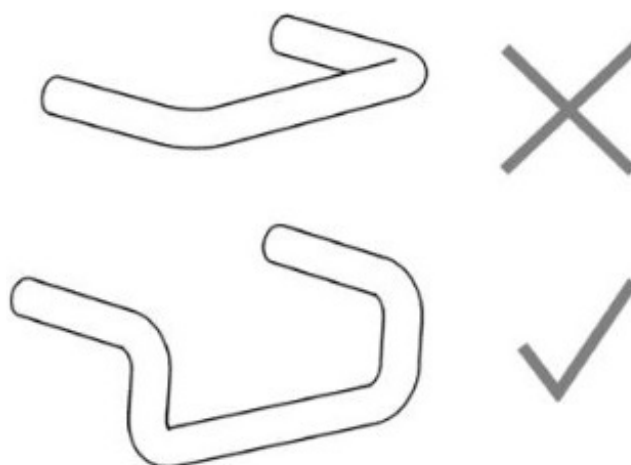


Figure 1 End of rungs treatment

Access device surfaces for workers should be designed to shed soiling materials such as mud and ballast.

The surfaces of stairs, rungs, and steps on rolling stock:

- (a) Should be slip resistant in all horizontal directions when tested using the AS/NZS 4586 Wet pendulum test with a suitable classification as determined by the RTO.
- (b) Should be slip resistant in all horizontal directions when tested using the AS/NZS 4586 Dry floor friction Test with a suitable classification as determined by the RTO.

Commentary C.4.5-2

A smooth or checker plate surface is not slip resistant, particularly with wet or muddy shoes.

The surfaces of stairs, rungs, and steps on passenger rolling stock and crew cars shall have a slip resistant coating or covering.

4.6 Boarding devices for passenger rolling stock

Self-deploying rolling stock mounted ramps shall be designed to prevent the train moving while not stowed.

Self-deploying rolling stock mounted ramps should be designed to prevent the retracting while people are on the ramp.

4.7 Hoists and lifts for passenger rolling stock

Rolling stock mounted external reach hoists should comply with AS/NZS 3856.1.

Rolling stock mounted internal lifts should comply with AS 1735.12.

Commentary C.4.7

For example, double deck trains.

Internal lifts should provide for back-up operation in the event of loss of main power.

Section 5 Access paths and access ways restraints

5.1 General

All access paths and access ways shall be kept clear of all hazards and obstacles throughout their vertical cross-sectional plane.

All access paths and access ways shall not provide direct access to overhead hazards unless controls are provided to mitigate against the risks created by any overhead hazards.

Commentary C 5.1

EN 50122 Provides information regarding prescribed minimum electrical clearances considering:

- equipment/system voltage; and
- a definition of a standing surface.

When utilising international standards, the definitions for terms such as high voltage and low voltage can vary from the definitions commonly used in the Australia context (i.e. as derived from AS 3000).

5.2 Dimensions – locomotive, crew cars and freight rolling stock

Access way width and height on locomotive, crew cars and freight rolling stock should comply with ISO 2867 or ISO 14122-2.

Commentary C.5.2-1

ISO 2867 is the least restrictive.

A minimum clear landing space of 600 mm deep by 450 mm wide should be provided at the top of exterior vertical rung ladders on rolling stock.

Commentary C.5.2-2

This is a turning area for reversing to go down the vertical ladder, and space for placing equipment that has been carried up or needs to be carried down, lifted up or lowered, or passed to another person.

5.3 Dimensions – passenger rolling stock

Vertical clearance height of access paths on passenger rolling stock should be a minimum of:

- (a) 1,800 mm below passenger visual displays; and
- (b) 2,000 mm elsewhere (excluding doorways).

Commentary C.5.3-1

Section 2.2 gives the height requirements for doorways.

Width of access ways on rolling stock, excluding DSAPT access paths, should comply with ISO 2867 or ISO 14122-2.

A minimum clear landing space of 600 mm deep by 450 mm wide should be provided at the top of exterior vertical rung ladders on rolling stock.

Commentary C.5.3-2

This is a turning area for reversing to go down the vertical ladder, and space for placing equipment that has been carried up or needs to be carried down, lifted up or lowered, or passed to another person.

5.4 Dimensions – infrastructure maintenance rolling stock

The minimum width of an access way at floor level shall be 380 mm.

Commentary C.5.4-1

To cover the issue of a walkway on the side of a vehicle where a person partially overhangs the side of the vehicle.

Access way width and height on rolling stock should comply with ISO 2867 or ISO 14122-2.

Commentary C.5.4-2

ISO 2867 is the least restrictive.

A minimum clear landing space of 600 mm deep by 450 mm wide should be provided at the top of exterior vertical rung ladders on rolling stock.

Commentary C.5.4-3

This is a turning area for reversing to go down the vertical ladder, and space for placing equipment that has been carried up or needs to be carried down, lifted up or lowered, or passed to another person.

5.5 Access way restraints

5.5.1 General requirements – locomotive rolling stock and crew cars

The lowest handhold, or the bottom of handrails, used for ground access shall be no more than 1,500 mm above rail.

Commentary C.5.5.1

Based on ISO 2867 requirements of max 1,700 mm above ground.

Guardrails shall be provided along the full length of open walkways, except at platform or ground access points.

Access way restraints should be of a minimum luminance contrast of 30% to the surrounding structures.

5.5.2 General requirements – freight rolling stock

The lowest handhold, or the bottom of handrails, used for ground access shall be no more than 1,500 mm above rail.

Commentary C.5.5.2-1

Based on ISO 2867 requirements of max 1,700 mm above ground.

Guardrails shall be provided along the full length of open walkways, except at platform or ground access points.

Where guardrails are not able to be fitted and a person could fall more than 2 m then mounting points, or horizontal lifeline or rail systems, suitable for fall-arrest and complying with AS/NZS 1891, shall be fitted.

Access way restraints should be of a minimum luminance contrast of 30% to the surrounding structures.

If workers are required to travel on a moving freight vehicle there shall be a position for this on the vehicle that provides restraint on all four sides of the occupant.

Commentary C.5.5.2-2

Conventional access devices are not suitable for workers (e.g., shunters) to ride on the side or end of a moving freight vehicle, as they do not offer sufficient restraint to prevent a fall.

5.5.3 General requirements – passenger rolling stock

The lowest handhold, or the bottom of grabrails or other access way restraints, used for ground access shall be no more than 1,500 mm above rail.

Guardrails shall be provided around the exterior of any open occupiable areas.

5.5.4 General requirements – infrastructure maintenance rolling stock

The lowest handhold, or the bottom of grabrails or other access way restraints, used for ground access shall be no more than 1,500 mm above rail.

Commentary C.5.5.4-1

Based on ISO 2867 requirements of max 1,700 mm above ground.

Guardrails shall be provided along the full length of open walkways, except at platform or ground access points.

Where guardrails are not able to be fitted and a person could fall more than 2 m then mounting points, or horizontal lifeline or rail systems, suitable for fall-arrest and complying with AS/NZS 1891, shall be fitted.

Access way restraints should be of a minimum luminance contrast of 30% to the surrounding structures.

Access way restraints on rolling stock shall comply with the requirements of AS 1657 or ISO 2867 or ISO 14122-3, subject to any supplementary requirements given in this section.

Rung ladders on rolling stock should have a continuous handrail on both sides of the rung ladder.

Commentary C.5.5.4-2

Continuous as in one piece, not requiring regripping. Could be the ladder stiles or separate handrails. AS 1657 Clause 5.6.8 states that “Handrails shall not be used for rung ladder”.

In rolling stock design, it is common to apply a continuous handrail on each side of the rung ladder, fitted in an ergonomic area close to the rung ladder to provide safe use.

Ladder handrails on rolling stock should be symmetrically located either side of the ladder.

The lowest handhold, or the bottom of handrails, used for ground access on rolling stock should be no more than 900 mm above rail or as low as practicable given restraints of rolling stock outline and bogie envelope.

Commentary C.5.5.4-3

Based on ISO 2867 and AS 1657 requirements of 900 mm above ground.

Access path restraints on passenger rolling stock shall comply with the strength requirements of either AS 1428.1, AS 1657, ISO 2867, or ISO 14122-3.

Access path restraints should be provided at places where passengers are likely to wait or stand on passenger rolling stock.

Access path restraints shall be provided along inter-car access paths.

Commentary C.5.5.4-4

Access path restraints assist passengers and workers to move from one carriage to another.

5.6 Slip and trip prevention**5.6.1 General requirements**

Floors and other walked-on surfaces should not have any sudden changes in level above 5 mm, excluding steps and ramp cleating.

The outer edge of the higher floor surface at the change in level greater than 5 mm should have a warning strip with:

- (a) a minimum luminance contrast of 30% to the floor;
- (b) a strip on horizontal surface with width of 50 mm to 75 mm.

5.6.2 Slip and trip prevention – locomotive, freight and infrastructure maintenance rolling stock

A ramp with a slope above 7° shall have either a slip resistant surface or cleating compliant with AS 1657, Table 3.1.

Commentary C.5.6.2

An aggressively surfaced coating is a suitable slip resistant treatment for a ramp; a chequer plate is not.

5.6.3 Slip and trip prevention – passenger rolling stock and crew cars

Access paths, access ways, standing and circulating areas and designated walked-on surfaces should be clear of obstructions. Any incursions into the walking person's space shall be clearly highlighted or labelled.

Commentary C.5.6.3-1

Lighting requirements for trip prevention are covered in AS 7531 for passenger rolling stock and crew cars.

Floor surfaces should be cleaned and maintained to AS/NZS 3661.2.

Commentary C.5.6.3-2

To remain slip resistance.

Floor surfaces on rolling stock should be slip resistant in all horizontal directions when tested using:

- (a) AS/NZS 4586 wet pendulum test with a suitable classification as determined by the RTO;
- (b) AS/NZS 4586 dry floor friction test with a suitable classification as determined by the RTO; or
- (c) equivalent standard acceptable to the RTO.

Floors and other walked-on surfaces on passenger rolling stock and crew cars should be plane and smooth as follows:

- (d) surfaces to be plane such that when a straight edge 1.5 m long is placed on the surface at any position, no part of the surface under the straight edge is more than 5 mm below the straight edge; and

- (e) surfaces to be smooth such that when a straight edge 150 mm long is placed on the surface at any position, no part of the surface under the straight edge is more than 1 mm below the straight edge.

5.7 Inter-car area

NOTE:

There are no requirements in Section 5.7 for locomotive, freight, or infrastructure maintenance rolling stock.

5.7.1 Passenger rolling stock and crew cars

Inter-car access between passenger carriages shall be provided for passengers and crew to the extent that the train configuration allows.

Commentary C.5.7.1-1

There could be limitations on access with some train configurations (e.g., between coupled multiple unit trains).

Inter-car doors that are not designed to be a fire barrier shall be able to latch or lock the door leaves in the open position in case of a fault or emergency to not restrict passenger movement between vehicles. The lock or latch shall be able to be operated in all operational conditions including emergencies, loss of power or vehicle rolled over internally and externally (where applicable) by the crew, passengers or emergency services.

Inter-car doors that are designed to be a fire barrier shall operate manually to open and shall revert to the closed position once persons have passed through. The closed position shall be the designed fully closed position to act as a fire barrier.

There shall be a means of egress through the inter-car access ways in order for passengers to evacuate through the train during an incident. This may be achieved by manually opening doors, including IEDR, or through openable hatches or removable panels within the door leaves.

Hatches or removable panels within inter-car door leaves shall be designed such that a 5th percentile Australian female through to a 95th percentile Australian male, can pass through unaided.

At the time this Standard was updated the most current Australian dataset is NHS's (2023) document 'iMove 6-002 Australian Size Variation for Design - M004: Detailed anthropometry dataset – V2.0', and should be used as the primary reference. Where a dimension is not available in this data set, an alternative Australian data set may be used to source this information.

Inter-car access doors shall be capable of being opened without the use of a key or specialized tool.

Gangways should be designed to minimize the relative movement of the surfaces of the gangway and provide protection from injurious gaps and pinch points.

Gangways should fully enclose the inter-car access path and be fire resistant if there are no inter-car doors.

Commentary C.5.7.1-2

In the event of an external fire.

Train livery should not be of a colour that permits inter-car gaps to be mistaken for doors.

Section 6 Emergency evacuation

6.1 General

Emergency exits widths and heights shall be sized using the most updated Australian anthropometric data for at least the 95th percentile Adult male aged 18-64 years. At the time this Standard was updated the most current Australian dataset is NHS's (2023) document 'iMove 6-002 Australian Size Variation for Design - M004: Detailed anthropometry dataset – V2.0', and should be used as the primary reference. Where a dimension is not available in this data set, an alternative Australian data set may be used to source this information.

Emergency exits shall be retained closed and latched under all normal operating conditions including shock/minor impact loads defined in AS 7520 and aerodynamic loads.

Emergency exits hinges, locks, structure and surrounding structure shall be designed to ensure that emergency exit failure (and thus ingress of debris) cannot occur during a rollover at the rolling stock maximum operating mass and speed.

The emergency exit assembly shall have an equivalent penetration resistance to the structure it is attached to.

6.2 Locomotive, power car locomotive and passenger rolling stock crew compartments

Locomotives, power car locomotive and passenger rolling stock crew compartments shall be fitted with multiple emergency exits.

At least 2 emergency exits shall be accessible at all times. This includes when the vehicle is upright and has come to rest on a frontal or side restriction, has been in a frontal impact collision, or has rolled over (including the vehicle coming to rest on its side or being inverted).

Each emergency exit shall be able to be opened by a person without any special tooling or key from either within the crew compartment or external to the crew compartment and shall not rely upon any power source (e.g., air or electricity) to be able to be operated.

Each emergency exit shall include handrails, steps and any other devices to enable a person to either evacuate from the crew compartment or a person to access the crew compartment externally under all potential orientations where the vehicle has come to rest.

Commentary C.6.2-1

Emergency exits can include doors, hatches (side or roof) or windows.

Emergency exit sign with words similar to "EMERGENCY EXIT – KEEP CLEAR" shall be placed at all emergency exit doorways.

If required, instructions on the operation of the emergency exit should be placed next to the emergency exit both internally and externally.

The design criteria for all emergency escape routes shall be set out in the requirements specification for the vehicle.

Performance of an emergency exit shall be verified by type testing against the design criteria.

Emergency equipment used for access and egress on a vehicle (including the back-up power sources, emergency door release devices, emergency exits, emergency ladders) shall be inspected, maintained, tested, and where applicable recertified in accordance with the manufacturer's instructions.

Commentary C.6.2-2

Refer to AS 7531 for requirements on emergency lighting.

Emergency exits on rolling stock shall be sized appropriately for the anthropometric data of users and should be at least 660 mm wide by 811 mm high.

Commentary C.6.2-3

For human and rescue stretcher/basket (e.g., stokes litter) access.

Reference data: Open Ergonomics. (2020). PeopleSize 2020 Visual Anthropometry Software.

The bottom edge of a wall-mounted emergency exit on rolling stock should be no more than 500 mm above the vehicle floor and shall be no more than 1,000 mm above the vehicle floor.

Commentary C.6.2-4

For accessibility.

Hinged/swing doors (if fitted) between a crew compartment and a vestibule shall open from the crew compartment into the vestibule in the direction of exit and shall not be obstructed or restricted by any equipment or structure.

6.3 Freight rolling stock

If there is a position within the vehicle where workers could be carried or regularly attend to carry out routine tasks (when stationary), then an emergency evacuation route from that position should be identified and visible signage provided.

6.4 Passenger rolling stock and crew cars

6.4.1 Escape routes

The effectiveness of escape routes on rolling stock should be checked with simulation software or by physical trials for meeting any required evacuation times.

Commentary C.6.4.1

Evacuation time requirements for passenger rolling stock and crew cars would derive from the fire safety assessment of the vehicle in accordance with AS 7529.3.

Refer to AS 7531 for requirements on emergency lighting.

Refer to AS 7528 for requirements on communication devices used for evacuation on rolling stock.

Cab transverse doors (if fitted) between the cab and the passenger compartment on rolling stock should not open into the driving cab.

Except for doors that are designed to be a fire barrier, doors that form part of the passenger evacuation route on rolling stock shall be able to be retained in the open position during passenger egress.

Escape route doors that are designed to be a fire barrier shall operate manually to open and shall revert to the closed position once persons have passed through. The closed position shall be the designed fully closed position to act as a fire barrier.

6.4.2 Emergency door release devices

Internal emergency door release devices shall be able to be operated by passengers without the need of keys or specialized tools.

Commentary C.6.4.2-1

Often there is a need to strike a balance between unauthorized egress and emergency egress. Systems which inhibit emergency door release such as driver deferral systems can achieve this balance when appropriately configured for the operational context. Systems such as these require timeout / override functionality such that if the driver is incapacitated, passengers are able to escape of their own accord in an emergency situation.

Operation of an emergency door release device on passenger rolling stock and crew cars should be evident to a worker and require worker action to reset.

Exterior emergency door release devices on passenger rolling stock and crew cars operating in service shall not require any key or specialized tool for operation unless the door has been intentionally locked out of use.

Exterior emergency door release devices shall be capable of being accessed when the vehicle is upright, inverted or on the upper side when overturned.

Emergency door release devices should be located closest to the door they release.

Where an emergency door release device is fitted to a lockable exterior passenger door, the emergency door release device should override the door lock.

A minimum of one exterior passenger door on each side of the carriage, on rolling stock, shall be fitted with internal and exterior emergency door releases located within 2 m of the edge of the doorway.

Internal powered doors on rolling stock shall be fitted with a mechanism to provide passage to either side of the door in emergency situations.

An activated emergency door release device on rolling stock shall produce a visual indication at the specific door.

An activated emergency door release device on rolling stock should produce an audible indication at the specific door.

Any activated or isolated emergency door release device on rolling stock should produce an indication to the crew.

Commentary C.6.4.2-2

It is desirable that indication is provided to the crew, however in some cases such as loss of power or degradation of onboard systems it is not always possible.

The crew indication would typically be an alarm or fault message to the cabs and/or train manager's console.

Internal and exterior emergency door release devices on rolling stock should function if the vehicle is oriented differently to in-service operation such as during a derailment or roll-over situation allowing the upward facing door to open, or to be assisted open by a manually operated mechanism.

Commentary C.6.4.2-3

For example, release a door if the vehicle is on its side, so it can be opened. This is particularly important for plug doors with over-centre locking.

Internal and exterior emergency door release devices for exterior passenger doors on rolling stock shall not operate unless the vehicle is assessed as stationary.

Exterior emergency door access devices on rolling stock should not be operable when the train is stabled.

The force required to operate any emergency door release device on rolling stock shall not exceed 150 N.

Internal and exterior emergency door release devices on rolling stock shall be operable irrespective of the availability of the normal train power supplies provided that the train is not stabled when exterior devices can be disabled.

Internal and exterior emergency door devices on rolling stock should be designed, positioned and guarded against accidental or malicious operation without compromising the expected functionality of the device.

Commentary C.6.4.2-4

Seals and signage are commonly used as they provide awareness of the device and can deter misuse.

6.4.3 Emergency exits

Removable exit windows (where fitted) should have a built-in lever, handle, or other similar device allowing the window to be removed without the need for any additional tooling that is not available adjacent to the exit window.

Removable exit windows (where fitted) shall not create any additional noise during normal train operations (e.g., whistling) and be sealed to prevent drafts and water ingress.

Commentary C.6.4.3-1

Emergency exit windows are typically either:

- a break-out type i.e. exit by smashing the glass (where a breakout hammer or other device provided to smash the glass would not be considered a tool in this case as it is considered an integral part of the window); or
- a removable type (exit by opening on a hinge or removed in one piece), often fitted with a pull handle attaching to a removable locking rubber or operated by releasing a latching mechanism on a hinged frame.

Emergency exit performance shall be verified in a type test.

Powered doors that form or contain emergency exits should be prevented from repowering after the emergency exit has been activated to prevent accidental trapping or injury.

For rolling stock operating in remote regional areas, at least one emergency exit window should be provided in each exterior side wall of each passenger sitting, dining, or sleeping compartment, unless that side wall is fitted with two or more exterior doors.

The following general provisions apply:

- (a) emergency exits on rolling stock should be at least 660 mm wide by 811 mm high;
- (b) the bottom edge of a wall-mounted emergency exit on rolling stock should be no more than 1,000 mm above the vehicle floor; and
- (c) emergency exits shall not be covered by anything that impedes the use of the emergency exit.

Commentary C.6.4.3-2

For human and stretcher access (e.g., stokes litter).

Examples include window films or advertisements which prevent use of the emergency exit.

Passenger exits on rolling stock shall:

- (d) for rolling stock operating in remote regional areas include:
 - (i) at least two emergency exit windows provided, in each exterior side wall of each large passenger sitting, dining, or sleeping compartment, unless that compartment's side wall is fitted with two or more exterior doors;
 - (ii) one emergency exit window shall be provided, in each exterior side wall of each small passenger sitting, dining, or sleeping compartment where it is impracticable to fit two emergency exit windows, unless that compartment's side wall is fitted with one or more exterior doors.

Commentary C.6.4.3-3

A compartment is designated to be large where it is practicable to fit two emergency exit windows on the exterior side walls.

A compartment is designated to be small where it is impracticable to fit two emergency exit windows on the exterior side walls.

- (e) for rolling stock operating in areas other than remote and regional areas provide means of adequate emergency exit from passenger sitting, dining, or sleeping compartments.

All internal doors which could block access to the exterior exit doors or between carriages shall be provided with:

- (f) emergency kick-out panels;
- (g) pop out windows;
- (h) break-out glass; and/or
- (i) other means which provide adequate access to the exterior exit doors or adjacent carriages.

Passenger rolling stock and crew cars should have at least one emergency roof entrance compliant with Section 238.441 of Title 49 of the USA Code of Federal Regulations (CFR).

Crew emergency exits should be fitted in confined working areas.

Commentary C.6.4.3-4

Such as galleys, and worker compartments.

A solution could be for emergency exit windows on each side and another emergency exit either in the front or rear of the compartment.

6.4.4 Emergency ladders

Portable emergency ladders should be able to be handled and assembled by one crew member.

Commentary C.6.4.4

Portable emergency ladders allow evacuation to ground level, or low-level platforms, where there is no fixed access device.

Portable ladders can allow higher passenger evacuation rates than could be achieved with fixed ladders and could be considered as part of train evacuation methodology.

Portable emergency ladders shall be stored in a location that can be accessed from both sides of the train or internally.

Portable emergency ladders should be able to be used at any exterior doorway on the train that does not have fixed ground level access.

Portable emergency ladders reaching the ground should provide varying heights adjustment.

At least one portable emergency ladder shall be carried for at least every three passenger vehicles where there are exterior passenger doors that do not have fixed ground level access.

Portable emergency ladders shall be designed for live loadings defined in AS 1657.

Handrails should be provided on both sides of the emergency ladder with access from the top through extended handrails.

6.4.5 Emergency signs

Details on what to do in an emergency, escape routes and emergency exit directions shall be displayed on interior signage or on passenger safety information cards within each passenger compartment on passenger rolling stock and crew cars.

Commentary C.6.4.5-1

AS 7528 contains general requirements for signs on passenger rolling stock and crew cars.

Each emergency exit and emergency door release device on passenger rolling stock and crew cars shall be identified by a sign at the device.

Emergency exit and emergency door release device signage inside passenger rolling stock and crew cars should contain pictorial and text instructions.

Emergency exit and emergency door release device signage inside passenger rolling stock and crew cars should be photo luminescent.

Exterior emergency door release device signage should be photo luminescent or reflective.

Exterior emergency entrances requiring cutting into the vehicle shall have the cutting area identified.

Commentary C.6.4.5-2

A suggested method of identifying an emergency roof entrance cutting area is by use of a plate bordering the area, with words such as "EMERGENCY SERVICES CUT HERE" stencilled into the plate.

6.4.6 Emergency equipment maintenance

Emergency equipment used for access and egress on a vehicle (including the back-up power sources, emergency door release devices, emergency exits, emergency ladders) shall be inspected, maintained, tested, and where applicable recertified in accordance with the manufacturer's instructions.

6.5 Infrastructure maintenance rolling stock

6.5.1 General requirements

Emergency exit sign with words equivalent or similar to "EMERGENCY EXIT – KEEP CLEAR" should be placed at all emergency exit doorways.

If required, instructions on the operation of the emergency exit should be placed next to the emergency exit.

Performance of an emergency exit shall be verified by type testing against the design criteria.

Emergency equipment used for access and egress on a vehicle (including the back-up power sources, emergency door release devices, emergency exits, emergency ladders) shall be inspected, maintained, tested, and where applicable recertified in accordance with the manufacturer's instructions.

Commentary C.6.5.1-1

Refer to AS 7531 for requirements on emergency lighting.

Spaces (rooms, cabins etc), on rolling stock, in which workers can be enclosed during operation, should be fitted with sufficient emergency exits to provide escape paths to the vehicle exterior when the vehicle is upright and when overturned on the side.

Commentary C.6.5.1-2

A solution could be having emergency exit windows on each side and another emergency exit either in the front or rear of the compartment.

Emergency exits should be at least 660 mm wide by 811 mm high.

Commentary C.6.5.1-3

For human and stretcher access (e.g., stokes litter).

The bottom edge of a wall-mounted emergency exit should be no more than 1,000 mm above the vehicle floor.

Commentary C.6.5.1-4

For accessibility.

Section 7 Passenger accessibility requirements

Commentary C.7

There are no requirements in Section 7 for locomotive, crew cars, freight, and infrastructure maintenance rolling stock.

The Federal Disability Standards for Accessible Public Transport 2002 (DSAPT) are made under Section 31(1) of the Disability Discrimination Act 1992 (DDA) and seek to eliminate discrimination, as far as possible, against people with disabilities from public transport services.

Section 7 of this Standard details requirements that are not dealt with in previous sections or could exceed the prescribed minimum requirements as detailed in the DSAPT.

7.1 Allocated spaces

Allocated spaces shall be provided on rolling stock. The allocated spaces should be located as near to accessible doors as practicable.

Commentary C.7.1

To facilitate timely boarding and alighting direct assistance provided by crew. Additional considerations include the proximity of the allocated space to designated crew positions, as can facilitate timely assistance being provided to the passenger and minimize operational delays.

Priority seating requirements shall comply with the requirements of AS 7498.

Allocated spaces shall have an access path to any essential facility deemed accessible.

7.2 Accessible toilets and showers

Where showers are fitted, accessible showers should be provided that maximize compliance with AS 1428.1 and AS 1428.2 within the limitations of the vehicle body.

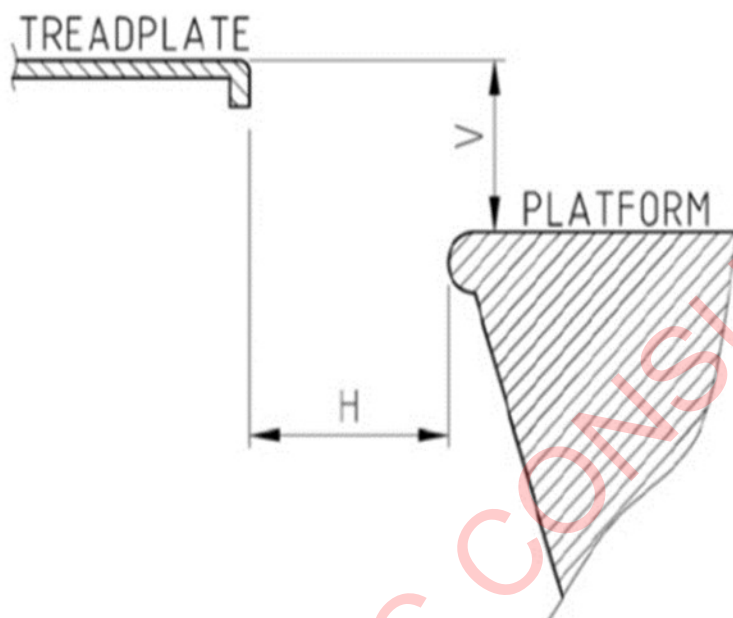
7.3 Accessible information

Signage, communication and information requirements shall comply with the requirements of AS 7528.

Appendix A Platform gaps (Normative)

A.1 General

Appendix Figure A.1 shows how platform gaps are measured, with H being the platform horizontal gap and V being the platform vertical gap.



Appendix Figure A.1 Platform gap

The platform gap limits described in this Standard are intended to be the maximum values likely to be measured from the treadplate to the platform, i.e. all normal rolling stock and infrastructure tolerances are included.

Appendix Equation A.1 – Platform step proportion

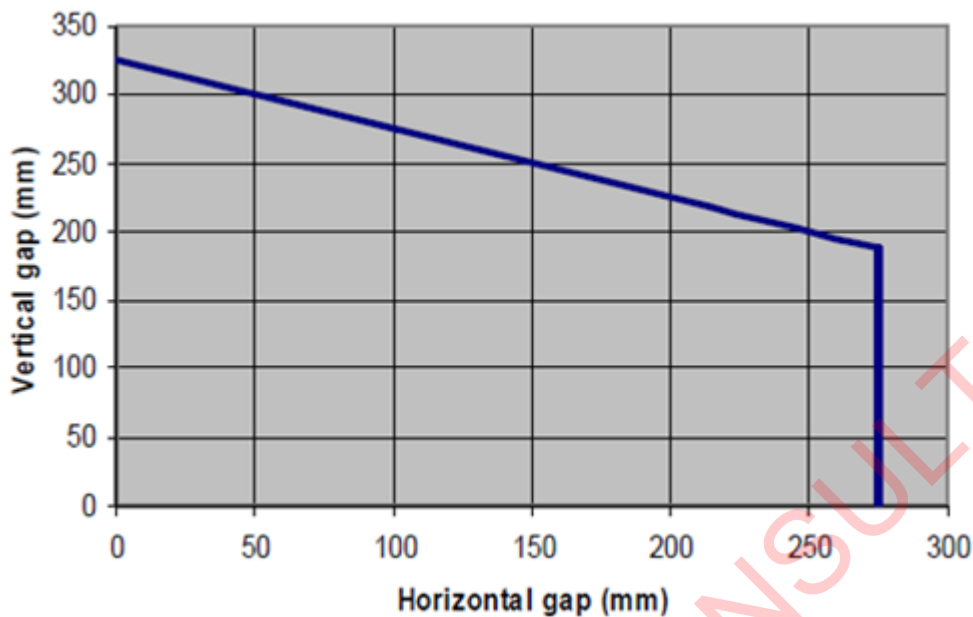
$$\text{Platform Step Proportion} = (H + 150) + 2 \times V$$

Where

H = Platform horizontal gap (mm)

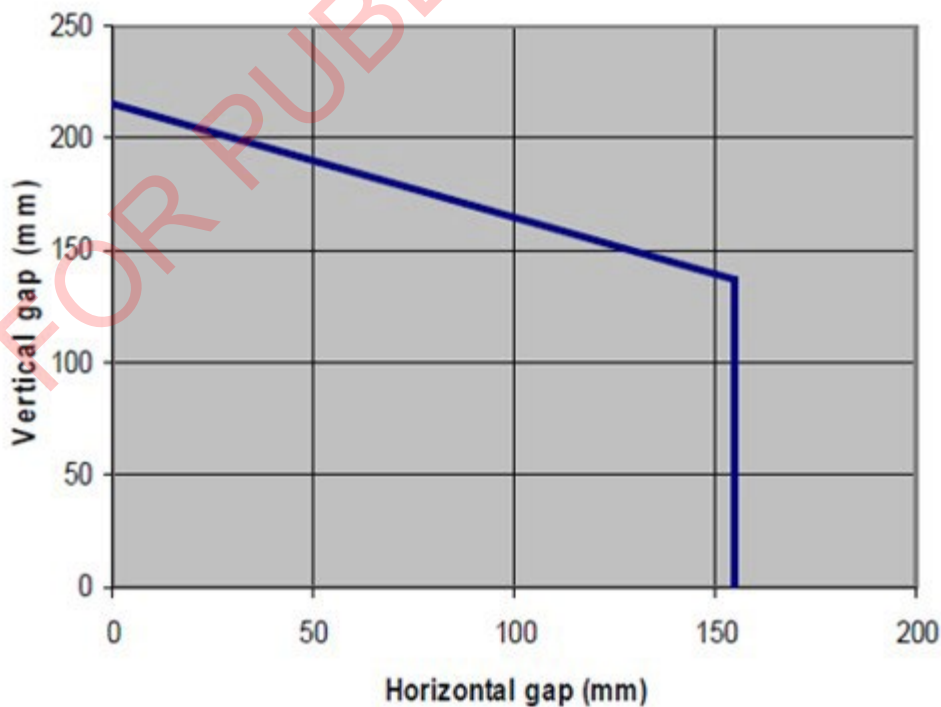
V = Platform vertical gap (mm)

Appendix Figure A.2 shows the maximum treadplate to platform gap, with the top sloping line based on the maximum platform step proportion of 800 mm



Appendix Figure A.2 Basic platform gap limits

Appendix Figure A.3 shows the maximum treadplate to platform gap for improved platform access, with the top sloping line based on the maximum platform step proportion of 580 mm.



Appendix Figure A.3 Improved platform gap limits

Commentary C.A.1

Appendix Equation A.1 is based on Appendix Figure A.1 Platform gap and ISO 2867, Table 1, Symbol J with foot allowance of 150 mm. $H = 0$ where the treadplate overlaps the platform.

Values of basic platform gaps from Appendix Figure A.2 Basic platform gap limits below and to the left of the plotted blue line meet the criteria defined in Section A.5.

Values of improved platform gaps from Appendix Figure A.3 Improved platform gap limits below and to the left of the plotted blue line meet the criteria defined in Section A.6.

A.2 Locomotive rolling stock

The maximum platform vertical gap on locomotive rolling stock should be 325 mm.

Commentary A.2-1

Appendix Figure A.1 parameter V for the typical platforms on the route maintained within the tolerance limits set for the network. Based on clause A.2.3 with zero horizontal gap.

The maximum platform horizontal gap on locomotive rolling stock should be 275 mm.

Commentary A.2-2

Appendix Figure A.1 parameter H for the typical platforms on the route maintained within the tolerance limits set for the network. Based on UK standard GM/RT2173.

The platform gap on locomotive rolling stock should have a maximum platform step proportion of 800 mm.

Commentary A.2-3

Appendix Equation A.1 parameter for the typical platforms on the route maintained within the tolerance limits set for the network. Value of 800 mm is equal to the ISO 2867, Table 1, Maximum step proportion.

A.3 Freight rolling stock

There are no requirements in Appendix A for freight rolling stock.

A.4 Passenger rolling stock and crew cars

The maximum treadplate to platform gaps for worker access on passenger rolling stock and crew cars should comply with the basic platform access limits prescribed in Section A.5.

For passenger rolling stock and crew cars that is to be compatible with existing rolling stock in regard to treadplate locations, and where the existing platform layouts cannot be altered, the maximum treadplate to platform gaps for passenger access should comply with the basic platform access limits prescribed in Section A.5.

Commentary A.4

The recommended treadplate to platform gap limits to apply for passenger access will depend on the situation in regard to desired compatibility with existing rolling stock, the level of passenger assistance to be provided, and whether new platform layouts can be used to improve access.

For passenger rolling stock and crew cars that will have passenger access with boarding devices when necessary, and where the platform layouts can be altered, the maximum treadplate to platform gaps for passenger access should comply with the improved platform access limits prescribed in Section A.6.

For passenger rolling stock and crew cars that will require passenger access without boarding devices, and where the platform layouts can be altered, the maximum treadplate to platform gaps for passenger access should comply with the ultimate platform access limits prescribed in Section A.7.

A.5 Passenger rolling stock and crew cars – Basic platform access

The maximum platform vertical gap for basic platform access on passenger rolling stock and crew cars should be 325 mm.

Commentary C.A.5-1

Appendix Figure A.1 parameter V for the typical platforms on the route maintained within the tolerance limits set for the network. Based on clause A.5.3 with zero horizontal gap.

The maximum platform horizontal gap for basic platform access on passenger rolling stock and crew cars should be 275 mm.

Commentary C.A.5-2

Appendix Figure A.1 parameter H for the typical platforms on the route maintained within the tolerance limits set for the network. Based on UK standard GM/RT2173.

The platform gap for basic platform access on passenger rolling stock and crew cars should have a maximum platform step proportion of 800 mm.

Commentary C.A.5-3

Appendix Equation A.1 parameter for the typical platforms on the route maintained within the tolerance limits set for the network. Value of 800 mm is equal to the ISO 2867, Table 1, Maximum step proportion.

A.6 Passenger rolling stock- Improved platform access

The maximum platform vertical gap for improved platform access should be 215 mm.

Commentary C.A.6-1

Appendix Figure A.1 parameter V for where the platform design and maintenance limits are suitable. Based on maximum step riser height from AS 1657 of 215 mm

The maximum platform horizontal gap for improved platform access should be 155 mm.

Commentary C.A.6-2

Appendix Figure A.1 parameter H for where the platform design and maintenance limits are suitable. Based on maximum step going from AS 1657 of 305 mm less 150 mm foot allowance.

The platform gap for improved platform access should have a maximum platform step proportion of 580 mm.

Commentary C.A.6-3

Appendix Equation A.1 – Platform step proportion parameter for where the platform design and maintenance limits are suitable. Value of 580 mm derived from A.6.1 at zero horizontal gap. Similar to ISO 2867 Basic Step Proportion value of 600 mm, EN 14752 recommended value of 640 mm and ISO 14122-3 lower limit of 600 mm.

A.7 Passenger rolling stock - Ultimate platform access

The maximum platform vertical gap for ultimate platform access should be 12 mm.

Commentary C.A.7-1

The vertical gap value relates to the DSAPT limits for independent access/egress. The platform vertical gap values given for ultimate platform access will be difficult to achieve on many existing networks due to legacy platforms, curved track, and the tolerances in vehicle height and track location.

The maximum platform horizontal gap for ultimate platform access should be 40 mm.

Commentary C.A.7-2

The horizontal gap value relates to the DSAPT limits for independent access/egress. The platform horizontal gap values given for ultimate platform access will be difficult to achieve on many existing networks due to legacy platforms, curved track, and the tolerances in vehicle height and track location.

A.8 Infrastructure maintenance rolling stock

There are no requirements in Appendix A for infrastructure maintenance rolling stock.

Appendix B Hazard register (Informative)

Hazard Number	Hazard
3.1.1	Security - Poor personal security - Human Error, Track Failure, Track Obstructions, Design Failure, Organizational SMS Failure, Vandalism and or Injury or Death
3.2.1	Security - A breach of Security - Injury or Death, Organisational SMS Failure and or Vandalism
3.3.1	Security - Harm to an Organisation - Human Error, Organisational SMS Failure
5.3.1	Rolling Stock - Harm to persons - Derailment or Collision, Human Error, Design Failure, Security Breach, Loads not Secure, and or Vandalism
8.4.1	Operations - Injury or Death of an Employee - Derailment or a Collision, Human Error, Track Failure, Track Obstruction, Design Failure, Health Failure, Organisation's SMS Failure, Environmental Impact, Security Breach, Load not Secure and or Vandalism
8.5.1	Operations - Injury or Death of a third Party - Derailment or a Collision, Human Error, Track Failure, Track Obstruction, Design Failure, Health Failure, Organisation's SMS Failure, Environmental Impact, Security Breach, Load not Secure and or Vandalism
8.6.1	Operations - Slips, Trips or Falls - Human Error, Design Failure, Health Failure, Security Breach, and or Vandalism

Bibliography (Informative)

The following referenced documents are used by this Standard for information only:

- AS 3000, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*
- BS EN 50122, *Railway applications. Fixed installations. Electrical safety, earthing and the return circuit*
- UK RSSB standard GMRT2173, *Size of Vehicles and Position of Equipment*
- Open Ergonomics (2020), *PeopleSize 2020 Visual Anthropometry Software*.