This technical note is issued by the Asset Standards Authority to notify the following changes to T HR RS 04001 ST Passenger Rolling Stock Access and Egress, version 1.0:

6.4 Emergency access and egress

Delete the following:

The third dot point, 'move from the carriage to another vehicle out the side doors' from this section.

Replace the last paragraph with the following:

The design of emergency door releases shall comply with Section 5.5 of EN 14752:2015 and shall include the requirements outlined in Section 6.4.1 and Section 6.4.2. The emergency access and egress requirements related to emergency exit windows and emergency service roof access are provided in Section 6.4.3 and Section 6.4.4 respectively.

Replace the section heading of Section 6.4.3 as follows:

6.4.3 Emergency windows
### Authorisation:

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Passenger Rolling Stock Access and Egress

Version 1.0

Issued date: 28 August 2017
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Standard governance

Owner: Lead Rolling Stock Engineer, Asset Standards Authority
Authoriser: Chief Engineer, Asset Standards Authority
Approver: Executive Director, Asset Standards Authority on behalf of the ASA Configuration Control Board

Document history

<table>
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Preface

The Asset Standards Authority (ASA) is a key strategic branch of Transport for NSW (TfNSW). As the network design and standards authority for NSW Transport Assets, as specified in the ASA Charter, the ASA identifies, selects, develops, publishes, maintains and controls a suite of requirements documents on behalf of TfNSW, the asset owner.

The ASA deploys TfNSW requirements for asset and safety assurance by creating and managing TfNSW’s governance models, documents and processes. To achieve this, the ASA focuses on four primary tasks:

- publishing and managing TfNSW’s process and requirements documents including TfNSW plans, standards, manuals and guides
- deploying TfNSW’s Authorised Engineering Organisation (AEO) framework
- continuously improving TfNSW’s Asset Management Framework
- collaborating with the Transport cluster and industry through open engagement

The AEO framework authorises engineering organisations to supply and provide asset related products and services to TfNSW. It works to assure the safety, quality and fitness for purpose of those products and services over the asset’s whole-of-life. AEOs are expected to demonstrate how they have applied the requirements of ASA documents, including TfNSW plans, standards and guides, when delivering assets and related services for TfNSW.

Compliance with ASA requirements by itself is not sufficient to ensure satisfactory outcomes for NSW Transport Assets. The ASA expects that professional judgement be used by competent personnel when using ASA requirements to produce those outcomes.

About this document

Historically, rolling stock requirements for doors within the NSW passenger rail environment were written into the specifications for each train contract and were mostly of a functional nature.

A historical document does not exist that mandates the requirements for access and egress of rolling stock passengers.

This standard sets the minimum requirements for the design of safe access and egress systems for rolling stock occupants on the TfNSW heavy rail network.

This standard is a first issue.
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1. Introduction

This standard sets the minimum requirements for the design of systems that aid in access and egress for rolling stock occupants during normal operation and emergencies.

The requirements within the Disability Standards for Accessible Public Transport 2002 form the primary source of requirements for access and egress systems, along with the requirements of EN 14752 Railway applications – Body side entrance systems for rolling stock and AS 7522.3: 2012 Australian Railway Rolling Stock - Access and Egress – Part 3 – Passenger Rolling Stock.

2. Purpose

The purpose of this standard is to provide a safe environment for the access and egress of rolling stock occupants on the Transport for NSW (TfNSW) heavy rail network.

These requirements enable a safe entry and exit for rolling stock occupants under normal operations and emergencies.

The requirements in this standard aim to provide assistance to emergency services as required in the safe evacuation of a heavy rail vehicle.

2.1. Scope

This standard provides requirements relating to entrance ways for rolling stock occupants in relation to the minimum width and height, glazing, draught screens, and end detrainment systems.

This standard also covers the requirements for emergency access and egress devices, door obstruction detection systems, platform interfaces, traction interlock, and brake interlock.

This standard does not cover the requirements for access through the roof by emergency services. Information about the location of safe areas to access vehicle interiors from the roof is covered within T MU RS 01000 ST Structural Integrity and Crashworthiness of Passenger Rolling Stock.

Maintenance requirements of access and egress systems are not covered by this standard, although the requirements of this standard are applicable over the life cycle of the asset.

This standard does not cover doors acting as fire barriers. For information relating to doors acting as fire barriers, refer to T HR RS 17010 ST Passenger Rolling Stock Fire Safety.

Rolling stock not operating on the TfNSW heavy rail network, such as those operating on rapid transit lines, is not covered in this standard.
2.2. Application

This standard applies to new passenger rolling stock operating on or intended for operation on the TfNSW heavy rail network.

This standard applies to existing rolling stock that undergo major modifications in the areas of access and egress, such as entranceways and their control, hand and grab-rails, seating, layout reconfiguration, detrainment, and train operating and management systems. Changes to these items can affect the passenger flow, manoeuvrability, and the operation of access and egress systems. Therefore, access and egress should be considered when these items are modified.

A so far as is reasonably practicable (SFAIRP) justification shall be undertaken to determine the level of a modification involving these systems to determine the applicability of this standard.

3. Reference documents

The following documents are cited in the text. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document applies.

**International standards**

EN 14752:2015 Railway applications - Body side entrance systems for rolling stock

GM/RT2100 Requirements for Rail Vehicle Structures

**Australian standards**

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 7522.3: 2012 Australian Railway Rolling Stock - Access and Egress – Part 3 - Passenger Rolling Stock

AS/NZS 1892.3 Portable ladders Part 3: Reinforced plastic

AS/NZS 1892.5 Portable ladders Part 5: Selection, safe use and care

AS/NZS 2080 Safety glazing for land vehicles

AS/NZS 4586 Slip resistance classification of new pedestrian surface materials

**Transport for NSW standards**

T HR HF 00001 ST Human Factors Integration - Rolling Stock
4. **Terms and definitions**

The following terms and definitions apply in this document:

- **EDR** emergency door release
- **DSAPT** Disability Standards for Accessible Public Transport
- **IEDR** internal emergency door release
- **NSW ambulance stretcher** stretchers used by the NSW ambulance as outlined in the NSW Ambulance document *Vehicle and Stretcher Dimensions as at 01/04/2015*, excluding the stretcher for bariatric ambulance specialist
- **SDO** selective door operation
- **SFAIRP** so far as is reasonably practicable

5. **Access and egress design requirements**

The access and egress design requirements for passenger rolling stock shall comply with the *Disability Standards for Accessible Public Transport 2002*, this standard, and the requirements of EN 14752 with the exception of requirements for treadplates and platform gaps. The requirements for treadplates and platform gaps are provided in Section 5.13 and Section 6.6.2
5.1. Compliance with disability standards for accessible public transport

Where areas are deemed necessary for access and egress by people with reduced mobility and where required by their service animals, these shall be designed in accordance with the Disability Standards for Accessible Public Transport 2002 (abbreviated as DSAPT).

5.2. Human factors integration

Passenger rolling stock shall be designed with consideration of human factors integration.

Rolling stock specific human factors requirements shall be referenced from T HR HF 00001 ST Human Factors Integration - Rolling Stock.

Anthropometric data sets and consideration of human factors in the design of access and egress for the vehicle shall be referenced from T MU HF 00001 ST Human Factors Integration – General Requirements.

5.3. Door design

The design of body side entrance systems shall comply with EN 14752.

However, the requirements specific to the width and height of the passenger body side door and crew body side door shall comply with the following requirements:

- passenger body side door minimum width and height

  Passenger body side doors shall have a minimum unobstructed useable width in compliance with DSAPT.

  Passenger body side doors shall have a minimum unobstructed useable height that allows a 95th percentile Australian male to walk through in an upright stature without striking their head.

- crew body side door minimum width and height

  Crew body side doors shall have a minimum unobstructed useable width which allows a crew member to board and alight comfortably from both platform level and track/ballast level whilst carrying a work bag, or tool bag, in a forward or reversing body position without twisting.

  Where crew doors are also used as emergency exits, the minimum unobstructed useable width shall be enough to accommodate a person being carried out on a NSW ambulance stretcher.
Crew body side doors shall have a minimum unobstructed useable height to accommodate the 95th percentile Australian male to walk through in an upright stature without striking their head.

### 5.3.1. Intercar access way design

Intercar access ways are located at the end of a vehicle and are primarily used for thoroughfare from one vehicle to an adjacent vehicle.

An open portal is an access doorway that has no door leaves.

Intercar access ways may be of an open portal, bi-parting sliding, single panel sliding or hinged door leaf type.

Intercar access ways with door leaves in the open position shall provide a minimum unobstructed useable width in compliance with DSAPT.

Intercar access ways shall have a minimum unobstructed useable height that allows a 95th percentile Australian male to walk through in an upright stature without striking their head.

Hinged door leaves shall open into the passenger area of the carriage and there shall be adequate space for passengers seated in end saloon seats to place their legs without interference.

There shall be a means provided for isolating the intercar doors in the open position in case of a fault to ensure passengers can safely move from one vehicle to another in an emergency. The isolation mechanism shall be located near the intercar doorway. The isolation mechanism shall not require a special key, device, or item to activate and shall be operable in normal conditions, emergencies, loss of power or vehicle on its side by either crew, rolling stock occupants or emergency services.

Hinged door leaves shall be provided with a mechanism to latch the doors safely in the open position.

Intercar access ways with bi-parting or single leaf doorways shall be fitted with obstruction detection in accordance with Section 6.1 of this standard.

The design of door tracks and surrounding enclosures of intercar doors shall aim to minimise, or where possible prevent, so far as is reasonably practicable (SFAIRP) the build-up of debris which could inhibit the opening and closing action.

Pinch points and trapping hazards that could be harmful to rolling stock occupants shall be minimised SFAIRP.

### 5.3.2. Passenger operated door controls

The design of passenger door controls for body side doors and intercar access ways shall comply with the requirements of *Part 21 Controls* in DSAPT.
There shall be a minimum of one passenger operated door control per door leaf on the interior and exterior of intercar access way doors.

5.3.3. Internal crew door

An internal crew door is a door separating the crew cab area from passenger area, sometimes called a crew transverse door.

Driving or crew compartments in passenger rolling stock adjacent to passenger areas shall incorporate an internal crew door that separates crew areas from passenger areas. The internal crew door shall be a swing type door that swings into the passenger area of the carriage.

There shall be a means of fast egress for crew to exit the cab area via the internal crew door using a panic bar. The panic bar shall require no more than 100 N force to operate.

There shall be an internal emergency door release (IEDR) located on the passenger area side of the internal crew door that has requirements outlined in Section 6.4.1.

The internal crew door shall have the following minimum dimensions:

- Internal crew door height
  
The internal crew door shall have a minimum unobstructed useable height to allow a 95\textsuperscript{th} percentile male to walk through in an upright stature without striking their head.

- Internal crew door width
  
The functional requirements of the doorway need to be taken into consideration when sizing the width of the doorway. The internal crew door may be used by crew, maintenance staff carrying tools and equipment and by rolling stock occupants during an evacuation through the end of a train.

  Where end detrainment is utilised, the internal crew door shall be wide enough to accommodate a NSW ambulance stretcher being carried by two 95\textsuperscript{th} percentile Australian males walking in single file.

5.3.4. Door windows

Windows with clear glazing shall be provided on all passenger body side doors to allow for passengers onboard and at platforms to see signage, crowding, and safe footing outside or inside the vehicle respectively.

Windows shall be provided on intercar access way doors to enable clear vision through to the adjacent vehicle from any point within the end saloon of a vehicle.

Body side door windows shall be sized and positioned to allow a 5\textsuperscript{th} percentile five year old Australian child and a 95\textsuperscript{th} percentile Australian adult male to be able to see the platform immediately outside the doorway whilst standing adjacent to the doors inside the vehicle.
Body side door windows shall be sized and positioned to allow a 5th percentile five year old Australian child and a 95th percentile Australian adult male to be able to see inside the vehicle whilst standing behind the yellow line of a platform near a vehicle doorway.

Glazing in door windows shall meet the strength requirements in accordance with AS/NZS 2080 Safety Glazing for land vehicles, T MU RS 01000 ST Structural Integrity and Crashworthiness of Passenger Rolling Stock, or an equivalent international standard to which the supplier shall demonstrate equivalence with the aforementioned standards.

Glazing may be tinted to reduce glare or light and heat transmittance, although it should not affect the functional requirements as set out previously in this Section.

5.4. **Train surfing**

Train surfing is the dangerous and illegal act of riding outside the vehicle, whether on the roof, side, front or rear while the train is in motion.

Step edges, ledges, buffers, anti-climbers, handholds on the outside surface of vehicles, including the body side and end structures, shall be avoided or designed so that they do not provide a firm grip for vandals to travel on the exterior of the train when doors are closed. The passenger rolling stock shall not allow for climbing to the roof area of the train from any part of the rolling stock.

5.5. **Draught screens**

A draught screen (also known as a weather shield) is a partition located at the interface between a passenger body side door and the seating areas.

The draught screen shall protect seated passengers adjacent to doorways from the effects of inclement weather and wind. A 95th percentile Australian male shall be able to sit comfortably adjacent to a draught screen and not have their knees affected by inclement weather or wind.

Draught screens, where fitted, shall not impede the access and egress of occupants during normal operation and emergencies.

Passengers with reduced mobility shall have sufficient space, especially users of wheelchairs and motorised carts, to manoeuvre past the screen and any vertical handrails. Refer to Part 2, Part 3, and Part 4 of DSAPT.

Draught screens shall not be placed between a doorway and a stairway to the upper or lower saloon of a double deck carriage.

Draught screens shall be made of clear glass in accordance with AS/NZS 2080 Safety glazing for land vehicles or an equivalent international standard with crashworthiness strength stated in T MU RS 01000 ST.
Draught screens shall provide vision through the end saloon area of the carriage for security purposes. Draught screens shall not hinder the vision of passengers in the end saloon area from seeing through to the outside of the train via the doorways.

5.6. **End detrainment system**

Where the rolling stock is required to operate through single line tunnels and a means of side evacuation is not available then an end detrainment system shall be provided at the front of each crew cab for evacuation of rolling stock occupants.

The end detrainment system shall allow safe passage for single file evacuation of the vehicle to upright passengers ranging from the 5th percentile Australian child to the 95th percentile Australian adult male.

Where persons with mobility aids such as walkers, wheelchairs, motorised scooters, and so on are to utilise the detrainment system, then they shall be assisted by able-bodied persons without the use of the aid. In cases where this is not possible, it is expected that these persons shall wait until assistance is available.

Clear instructions on the deployment and safe use of the end detrainment system shall be provided in a location that will not become obscured and is readily seen by a person near the end detrainment system.

The end detrainment system shall not be able to be deployed, activated, or initiated when the train is in motion.

When the end detrainment system is deployed, the brakes shall not be able to be released or traction applied. The train shall remain stationary.

The end detrainment system, when deployed, shall fit wholly within the rolling stock outline of the train it is fitted to, in accordance with T HR RS 00100 ST RSU 100 Series – Minimum Operating Standards for Rolling Stock – General Interface Standards.

The following additional end detrainment system requirements shall be complied with:

- Doors at the end of vehicles that are used for detrainment during an emergency shall have a minimum unrestricted useable width that allows the egress of a 95th percentile male passenger being carried out in single file on a NSW ambulance stretcher.
- Doors at the end of vehicles that are used for detrainment during an emergency shall have a minimum unrestricted useable height that allows the safe egress of two 95th percentile males carrying a passenger on a NSW ambulance stretcher in single file.
- Where unit to unit egress is required, end doors shall be aligned SFAIRP with the opposing cab end door, bearing in mind the size of the driver's desk in the cab. The throughway design shall allow the safe egress of a person being carried out on a NSW ambulance stretcher.
stretcher by two 95th percentile males and prevent falling from the walkway to ensure the safety of rolling stock occupants moving between the carriages.

- Where unit to track egress is required, a means to prevent falling from the walkway shall be provided.
- The end detrainment system shall not require a force of more than 200 N to deploy in order to prevent injuries to persons operating it.
- The end detrainment system shall be possible to be deployed by a 5th percentile adult female in relation to strength and physical dimensions, untrained in the deployment of the system, within a period of time as necessitated by the operators required evacuation time frame.
- The end detrainment system shall provide adequate slip resistance, especially if a ramp is utilised, to ensure persons do not slip while traversing it. Where an angle of greater than 15 degrees is utilised for a ramp then cleats shall be provided for additional footing grip.
- The end detrainment system shall be illuminated such that persons traversing the system are able to see their feet on the system and their hands on guide rails.
- The safe working limit in both number of passengers and weight in kilograms shall be clearly displayed on signage and decals for the detrainment system and in any working instructions and maintenance manuals.
- The final step from the end detrainment system to track sleeper level shall be no greater than 250 mm for all track configurations.
- The end detrainment system’s length and width shall be maximised while taking into account other key vehicle end design parameters, including the location and layout of crew workstations, crashworthiness and driver sightlines.
- When deployed, the end detrainment system shall be secured in the deployed condition to prevent accidental closure.

5.7. External body side steps and ladders

The access path between a platform and a carriage floor through a body side doorway shall avoid the use of steps. Where steps at doorways during normal operation are necessitated these shall comply with Section 5.7.1. All external steps, ladders, and handholds shall also comply with T HR RS 00100 ST.

5.7.1. Doorway steps

Steps at doorways shall have at least the same clear width as the door and have a maximum of one riser.
The step riser shall be no higher than a 5th percentile child wearing shoes can safely walk up or down without assistance. Consideration shall be taken of the elderly and mobility impaired when sizing risers to ensure the safety of these groups of people boarding and alighting the carriage.

The tread depth shall be adequate for a 95th percentile male wearing shoes to place their foot safely whilst walking up or down.

Steps shall remain wholly within the static outline of the vehicle as defined in T HR RS 00100 ST.

5.7.2. Fixed external ladders

The safety of crew and rolling stock occupants using fixed external ladders shall be maximised. Consideration shall be made for the types of users of fixed external ladders in relation to any equipment that might be carried into or out of the doorway.

Fixed ladders used for entering or exiting the vehicle from below track level or track level to floor level and vice versa shall have vertical stops on either side of each rung to prevent feet from slipping off the ends.

Fixed ladders shall remain wholly within the static rolling stock outline as defined in T HR RS 00100 ST.

Ladder design shall be based on AS 1657 *Fixed platforms, walkways, stairways and ladders - Design, construction and installation*.

Sufficient rungs and handholds shall be provided to ensure three-point contact during ascending or descending ladders.

5.7.3. Step and ladder surface

A nosing strip is a strip of slip resistant material affixed to the leading edge of a step in order to aid angular placement of feet whilst climbing ladders or stairs.

Steps shall be provided with a slip resistant surface and nosing strip.

Fixed external ladder rungs shall be provided with a slip resistant surface.

Slip resistance shall be to at least classification R10 in all horizontal directions when tested using AS/NZS 4586 *Slip resistance classification of new pedestrian surface materials*.

Construction tolerances for abutment of surfaces, including nosing strips on steps, shall comply with the requirements in Section 7.2 of AS 1428.1 *Design for access and mobility Part 1: General requirements for access - New building work*.

Steps shall have a front edge with a radius between 10 mm and 15 mm.
5.8. **Internal stairs**

The design of stairs within passenger rolling stock shall comply with DSAPT.

Stairways to lower and upper saloons shall SFAIRP be wide enough to accommodate two 95th percentile males carrying a person on a NSW ambulance stretcher in single file.

5.9. **Mechanical strength of doors, external steps and ladders**

The mechanical strength of doors shall comply with T MU RS 01000 ST *Structural Integrity and Crashworthiness of Passenger Rolling Stock*.

The mechanical strength of external steps and ladders shall comply with the requirements in Section 5.5 of GM/RT2100 *Requirements for Rail Vehicle Structure*, Issue 5 June 2012.

5.10. **Emergency ladders**

An emergency ladder is a portable ladder that is usually stowed away either onboard in a cabinet or on the under carriage of a passenger rolling stock vehicle.

Emergency ladders shall be provided where there is no other means of detraining rolling stock occupants in a safe manner via fixed external ladders, steps, or ramps to track level or ballast level.

If emergency ladders are required by the train specification, operational requirements, or due to the design of the rolling stock, the requirements stated in Section 5.10.1 and Section 5.10.2 shall apply.

Emergency ladders shall only be used for emergency evacuation of a train.

No more than one person at a time shall be allowed to use the ladder when deployed.

Emergency ladders are not expected to be of the step-through type unless specifically demanded in the design specification.

If emergency ladders are expected to be used, there shall be sufficient landing space at the top of the ladder for a user to safely step onto the ladder from the rolling stock floor or vice versa.

The safe working limit of the ladder shall be displayed by decal clearly on the ladder and near the stowage area.

5.10.1. **Emergency ladder specifications**

Emergency ladder operating dimensions shall be such that they can be used to climb from low-lying ballast to vehicle floor level, either at the end of the train or at any doorway, and have at least two rungs higher than floor level when placed at an angle less than 75 degrees from the ground.
Emergency ladders shall have a hook or pin mechanism that secures it to the floor of the vehicle preventing lateral movement. Vehicles shall have a means to securely accommodate the hook or pin mechanism of the emergency ladder.

Emergency ladders shall have a mass that allows a 5th percentile female to be able to deploy, carry and store it without assistance. Emergency ladders shall be constructed of non-electrically conductive material such as fibreglass.

Emergency ladders shall be designed in accordance with AS/NZS 1892.3 Portable ladders Part 3: Reinforced plastic and AS/NZS 1892.5 Portable ladders Part 5: Selection, safe use and care.

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5.11. **Door impact forces and closing and opening forces of doorways**

To prevent injuries to rolling stock occupants, the forces generated by a closing door leaf shall be minimised. The forces generated by a closing or opening door leaf shall be no more than as specified in EN 14752. These forces shall be tested at locations in accordance with Figure 12 of EN 14752:2015. These requirements apply to bi-parting or single leaf operation, plug type, or sliding doors.

5.12. **Luminance contrast**

Steps and ladders shall be provided with a luminance contrast in accordance with Section 11.1 of AS 1428.1.

Passenger body side doorways, inter-car doorways and end doors shall be provided with a luminance contrast with surrounding surfaces in accordance with Section 13.1 of AS 1428.1.

5.13. **Treadplates for doorways**

Doorways shall be fitted with treadplates (also known as threshold plates, sill plates or door sills) that are compliant with clause 2.4 of AS 7522.3: 2012 *Australian Railway Rolling Stock – Access and Egress – Part 3 - Passenger Rolling Stock.*

Where a treadplate abuts a section of flooring or a step, or overlaps a section of flooring or a step, then the construction tolerances for the abutment of surfaces shall comply with the requirements in Section 7.2 of AS 1428.1.

Treadplates shall not infringe rolling stock outline requirements as specified in T HR RS 00100 ST.

5.14. **Drainage**

Provision shall be made to divert water runoff from the roof area and side sheeting of the train to prevent it from entering the interior of any door portal, and SFAIRP to prevent water dripping onto the guard while they are performing their duties.

Provision to prevent water pooling at the threshold of the door portal shall be made.

The diameter of the drainage holes on flooring shall be sized so as to not trap the heels of stiletto type shoes and is applicable for all locations requiring drainage such as, but not limited to, door thresholds, gangways and fixed or moveable steps.

5.15. **Electrical protection**

Electrical equipment used in the operation of access and egress systems shall comply with T HR RS 00117 ST *Electric Circuits and Equipment for Passenger Rolling Stock.*
5.16. **Lighting**

Interior and exterior lighting for access and egress shall comply with the specific requirements within T HR RS 12001 ST *Interior and Exterior Lighting for Passenger Rolling Stock*.

5.17. **Environmental conditions**

The environmental conditions to be considered in the design of access and egress systems are detailed within T MU RS 17001 ST *Environmental Conditions for Rolling Stock*.

5.18. **Fire**

Fire safety requirements in T HR RS 17010 ST *Passenger Rolling Stock Fire Safety* shall be complied with for all access and egress related topics.

5.19. **Toilets**

Where required, passenger rolling stock shall provide accessible toilets as in accordance with DSAPT.

Automatic powered toilet doors shall have obstruction detection to prevent the trapping of persons between the car and the door leaf.

Obstruction detection within toilet doors shall detect objects as small as a 5th percentile child's fingers.

Upon detecting an obstruction, the door will release power and allow a trapped person to move the door with no more than 150 N force to safely remove the obstruction.

The time to reclose a powered toilet door after an obstruction has been detected shall be adjustable but no sooner than three seconds after detection.

Toilet doors shall be designed to eliminate SFAIRP pinch points and trapping hazards of rolling stock occupants' body parts.

5.20. **Water tightness**

Access and egress systems shall be designed such that the potential for damaging levels of water ingress into the vehicle passenger and crew areas, and equipment mounted in the door portal area, is controlled and minimised SFAIRP. This can be achieved through effective use of seals, deflectors or other similar means.

5.21. **Slip and trip prevention**

Slip and trip prevention shall be in accordance with section 5.4 of AS 7522.3: 2012.
5.22. Boarding devices

New rolling stock shall be designed to accommodate any existing boarding devices used on the TfNSW heavy rail network at the time of signing the contract.

New boarding devices shall be designed to fit any existing rolling stock used on the TfNSW heavy rail network at the time of signing the contract.

Boarding devices shall comply with DSAPT.

5.23. Gangway design

Gangways located at the interface between two carriages shall be surrounded by an enclosure that will prevent the ingress of inclement weather, including rain, wind, hail, dust, and dirt.

SFAIRP gangways enclosures shall be full body width of the rolling stock to minimise possible fall injuries of people located on a platform adjacent to a gangway. Narrow gangways with the potential to allow passengers to fall between the cars are not acceptable.

The exterior of a gangway shall not visually resemble a doorway where passengers may attempt to access the vehicle in error.

Gangways shall provide flooring which is slip resistant and minimises the likelihood of trip hazards or pinch points.

Linings within gangways shall be designed to minimise SFAIRP the likelihood of pinch points.

Construction tolerance of gangway treadplates shall comply with AS 1428.2 Design for access and mobility Part 2: Enhanced and additional requirements - Buildings and facilities.

6. Operational requirements

The operational requirements in Section 5.2 of EN 14752 shall be complied with. In addition, the requirements stated in Section 6.1 to Section 6.7 shall be complied with.

6.1. Obstruction detection

Provision shall be made to detect when a door is obstructed in both the opening and closing directions.

The system to detect obstructions may be a sensitive edge, force detection, over-current detection, optical, infrared, proximity or motion sensor type or other method of obstruction detection, all of which shall ensure the safety of passengers such that injury and harm is prevented or minimised SFAIRP.
6.1.1. Closing

When an obstruction in the door is detected while closing, one of the following shall be carried out:

- fully open the door
- reopen the door partially to allow the obstruction to be safely removed from between abutting edges of the door
- release operational power for the ability to move door leaves manually

A minimum of 0.5 s shall be set before the doors attempt to reclose after the obstruction has been detected. The time delay shall be programmable above the minimum.

The doors shall attempt to reclose for a minimum of three cycles whereby if the obstruction is still present, the doors shall fully open and remain in the open position until reset by an authorised person. The number of closures shall be programmable above the minimum amount.

6.1.2. Opening

When an obstruction in the door is detected while opening, the operational power shall be released to move the door manually and clear the obstruction.

A minimum of 0.5 s time delay shall pass before the doors attempt to open after the obstruction has been detected. The time delay shall be programmable above the minimum.

The doors shall attempt to reopen for a minimum of three cycles whereby if the obstruction is still present, the doors shall remain in their current position with a door fault indication displayed to the driver and shall not clear until reset by an authorised person.

6.1.3. Obstruction detection sensitivity

The sensitivity of obstruction detection systems shall comply with Section 5.2.1.4.1 of EN 14752:2015.

6.1.4. Anti-drag

Anti-drag is a system whereby small or thin objects can be detected by the doorway; for example bag straps, coats and so on. When these items are caught in the door and the vehicle attempts to move off from a stationary position, the caught item shall be registered by the system and the vehicle shall apply the brakes.

Where specified in the technical specification or operational needs, the anti-drag system shall comply with Section 5.2.1.5 of EN 14752:2015.
6.2. **Traction interlock**

The traction system shall be designed such that the traction power is not available when any passenger body side door is not closed and locked.

Provision for isolation of the traction interlock system by an authorised process shall be enabled in the event of a door that has failed to close properly or lock. In this case, the door shall be able to be manually closed and suitably restrained before the train proceeds.

If a door has failed in the open state, suitable means shall be provided to enable the failed door to be manually closed and locked. If the door cannot be manually closed and locked, for example due to physical damage, then the operator shall implement suitable procedures to ensure safety of passengers and safe movement of the affected vehicle.

6.3. **Brake interlock**

The doors shall be designed such that a passenger body side door open command initiated from the crew control panel or the local door control panel does not function when the brakes are released.

Brakes shall not be able to be released while any passenger body side door is not closed and locked.

The brake interlock system shall have the provision to override the brake interlock functionality. The override facility to the brake interlock system shall be located within the crew compartment. Use of the override facility shall be recorded in the data logger.

Brake interlock shall be overridden by emergency door release activation. If brake interlock is overridden by emergency door release (EDR) activation, this shall be recorded in the data logger.

6.4. **Emergency access and egress**

The operator shall develop emergency access and egress procedures to ensure the safe evacuation of rolling stock occupants in an emergency. TfNSW expects vehicle occupants to be able to undertake the following in an emergency:

- move to an adjoining carriage of the same rolling stock to separate themselves from a hazardous situation
- move from the carriage to a platform where available
- move from the carriage to another vehicle out the side doors
- move from the vehicle to another vehicle out the end doors
• move from the vehicle to track level out the end doors
• move from the vehicle to track level out the side doors

Provision shall be made for the safe movement of vehicle occupants during all of the above scenarios.

The emergency access and egress requirements related to internal emergency door release (IEDR) and emergency door release (EDR) are provided in Section 6.4.1 and Section 6.4.2 respectively.

Emergency access and egress devices allow passengers, emergency services, train crew, and other persons the ability to open doors from outside (access) or inside (egress) the vehicle.

The design of emergency door releases shall comply with Section 5.5 of EN 14752:2015 and shall include the requirements outlined in Section 6.4.1 and Section 6.4.2. The emergency access and egress requirements related to emergency exit windows and panels and emergency service roof access are provided in Section 6.4.3 and Section 6.4.4 respectively.

6.4.1. Internal emergency door release (egress device)

Passengers shall be able to open passenger body side doors, intercar doors, internal crew doors and carriage end doors from the inside of the vehicle by using an IEDR during an emergency.

The IEDR shall not be operable at speeds in excess of 5 km/h.

The IEDR shall be alarmed visually and audibly to notify crew or operations of its use.

The train crew or operations centre shall have a provision to override the activation of the IEDR within a designated amount of time after an attempt to operate it by a rolling stock occupant.

The designated amount of time shall be enough for the train crew or operations centre to assess the current situation for the need to use the device, the safety of vehicle occupants if they were to exit the vehicle, to speak with the user of the device via intercom and to react appropriately to initiate the override function.

IEDR shall function under loss of power for an amount of time as defined in T HR RS 10001 ST Electric Auxiliary Power Supply and Battery System for Passenger Rolling Stock.

6.4.2. Emergency door release (access device)

The ability to allow access to the interior of the vehicle from outside by using an EDR shall be provided.

The operating element of the EDR shall be located in the area adjacent to the door at a height that can be operated from below track level (for raised ballast areas), track level, and platform level by a 5th percentile Australian female in relation to height and reach.
A minimum of one EDR per vehicle side shall be provided and located diagonally opposite at each end of the vehicle.

The EDR shall have a cover that can be lifted upwards or opened sideways and provides protection during normal operation of the vehicle. The EDR cover shall have a means to prevent the possibility of it opening when the train is in motion.

The EDR shall be clearly labelled on the outside, either on the cover or immediately above it on the body, with the words ‘Emergency door release’.

An informative decal in compliance with T MU RS 17003 ST Signage for Passenger Rolling Stock that gives basic operating instructions shall be provided on the underside of the EDR cover.

To allow a range of people from the 5th percentile adult female to the 97.5th percentile adult male to operate the controls, the force to operate the EDR shall not exceed 200 N if a lever with Bowden cable or similar mechanical method is used, and not more than 20 N if a push button or twist type switch is used.

The EDR shall function under loss of power for a predetermined amount of time that shall be detailed in the performance specification. The EDR shall comply with the static rolling stock outline requirements as specified in T HR RS 00100 ST.

6.4.3. Emergency windows and panels

Rolling stock that does not have a means of end detrainment, operates in remote regional areas, or has locations within the rolling stock where access to the exterior door exits are blocked shall provide an alternate emergency exit window.

Emergency exit windows shall be sized to allow a NSW ambulance stretcher carrying a 97.5th percentile male to be passed through safely.

Emergency exit windows shall have signage nearby detailing when rolling stock occupants are allowed to use it and how to use the exit.

It shall not be possible for the emergency exit window to come free in normal service, nor to be accidentally opened or broken.

Emergency exit windows shall satisfy any related requirements in T MU RS 01000 ST.

6.4.4. Emergency services roof access

For access via the roof by emergency services, a location shall be provided as outlined in T MU RS 01000 ST.
6.5. **Selective door operation**

Where there is a risk that the overall train length can exceed the platform length such that some or all doors do not open next to a platform, then a selective door operation (SDO) system shall be fitted.

Where SDO is implemented, the train crew compartment shall have the provision to isolate selected doorways using the SDO function.

For driver only operation or when automatic train operation is in use, the driver or the operations centre shall be able to isolate selected doorways as required.

SDO may be automated by sensors to detect the presence of a platform, or platform screen door. Refer to Section 6.6.1.

6.6. **Platform interface**

The platform interface requirements for the detection of platforms, platform gaps, and platform screen doors are provided in Sections 6.6.1 to Section 6.6.3.

6.6.1. **Platform detection**

Heavy rail passenger rolling stock shall have the provision to automatically detect when the train, carriage, or doorway is adjacent to a platform to prevent the following:

- offside doors from opening at a platform
- doors opening with no adjacent platform
- door opening with no adjacent platform screen door (where fitted and operational)

6.6.2. **Platform gaps**

The allowable gap between the train and the platform edge shall be in accordance with Section 2.4.2 of AS 7522.3: 2012.

Platform gaps shall be minimised SFAIRP by designing rolling stock appropriately. The design of stations and the alignment of track may affect the platform gaps, which are out of the control of the rolling stock designer.

6.6.3. **Platform screen doors**

Where platform screen doors are fitted at a station, opening a passenger body side door shall not be possible unless an adjacent pair of functional platform doors is synchronised to open in conjunction with the passenger body side doors.

Where rolling stock body side doors do not align so that they open wholly within the area covered by a platform screen door, then an audible and visual indication shall be given to train
crew or operations, and the rolling stock body side doors at those locations shall not open. An audible and visual indication shall also be given to rolling stock occupants near the doorway informing them of the nature of the error.

6.7. Onboard access paths

Designated access areas for users of wheelchairs, motorised scooters, or other reduced mobility aids shall comply with Part 2, Part 3, and Part 4 of DSAPT, for access paths and manoeuvring and passing areas.

This requirement is to ensure that these users have adequate space to freely move in and out of the vehicle, and not to cause or be affected by congestion.

Designated access areas for users of wheelchairs to pass others shall comply with DSAPT. These areas are typically located in the end saloon or vestibule as passing is not deemed possible in aisle ways.