Public Address Systems

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Standard governance

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Document history

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Preface

The Asset Standards Authority (ASA) is an independent unit within Transport for NSW (TfNSW) and is the network design and standards authority for defined NSW transport assets.

The ASA is responsible for developing engineering governance frameworks to support industry delivery in the assurance of design, safety, integrity, construction, and commissioning of transport assets for the whole asset life cycle. In order to achieve this, the ASA effectively discharges obligations as the authority for various technical, process, and planning matters across the asset life cycle.

The ASA collaborates with industry using stakeholder engagement activities to assist in achieving its mission. These activities help align the ASA to broader government expectations of making it clearer, simpler, and more attractive to do business within the NSW transport industry, allowing the supply chain to deliver safe, efficient, and competent transport services.

The ASA develops, maintains, controls, and publishes a suite of standards and other documentation for transport assets of TfNSW. Further, the ASA ensures that these standards are performance-based to create opportunities for innovation and improve access to a broader competitive supply chain.

This document specifies the minimum requirements for public address systems used within the public transport buildings and conveyances.

This document is a first issue.
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1. Introduction

The *Disability Standards for Accessible Public Transport 2002* states the following:

“General information about transport services must be accessible to all passengers”.

The *Disability Standards for Accessible Public Transport Guidelines 2004 (No. 3)* states the following:

“Operators or providers will supply all passengers with information necessary to use a transport service”.

General information is associated with transport services and facilities, including regular service information, and planned and unplanned disruptions.

Public address systems are necessary to deliver information, in particular to customers with vision impairments, without the need for direct assistance.

However, to provide general information that is accessible to all passengers, other communication channels such as hearing augmentation for those with a hearing impairment and textual display for the deaf are required.

2. Purpose

This document standardises the minimum requirements for public address systems (PAS) used in public transport buildings and conveyances.

2.1. Scope

The scope of this document is to cover the minimum requirements for the following:

- local and remote spoken announcements
- local and remote automated announcements
- hearing augmentation
- passenger information displays (PID)
Principal system and subsystem interfaces are depicted in Figure 1.

Figure 1 is informational and not intended to convey any architectural requirement. Solid lines represent system and system interfaces. Dashed lines represent subsystems and subsystem interfaces.

Hearing augmentation is also required in other situations, as defined in Disability Standards for Accessible Public Transport and Disability (Access to Premises – Buildings) Standards, which are out of scope of this standard.

Inbuilt communication systems that are not considered public address systems are not in scope of this document.
Examples include the following:

- information or emergency help points
- inbuilt amplification systems installed in a ticket office
- discrete communication systems only used for communication of discretionary customer information such as commercial advertising

### 2.2. Application

This standard applies to the public address system used in the stations and stops for heavy rail, light rail and rapid transit and in the heavy rail and light rail rolling stock that provides a public transport service.

This standard applies to new and altered assets and capital maintenance.

*Note that while this standard applies irrespective of the significance of change, a concession may be granted if the new or altered assets are within an existing commissioned system, which has not reached the end of its useful life.*

This standard does not apply to recurrent maintenance.

This standard does not apply to contracts and tenders released before the publication of this document.

### 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 50125-1 Railway Applications - Environmental Conditions for Equipment - Rolling Stock and On-board Equipment

EN 50125-3 Railway Application - Environmental Conditions for Equipment - Equipment for Signalling and Telecommunications

EN 60950-1 Information technology equipment - Safety - General requirements
PD IEC TR 62380 Reliability data handbook - Universal model for reliability prediction of electronics components, PCBs and equipment

IEC 60050-191 International Electrotechnical Vocabulary. Chapter 191: Dependability and quality of service

IEC 60268-16:2011 Sound system equipment - Part 16: Objective rating of speech intelligibility by speech transmission index

IETF RFC 6241 Network Configuration Protocol (NETCONF)

ITU-R BS.1770-3 Algorithms to measure audio programme loudness and true-peak audio level

**Australian standards**

AS 1428.2-1992 Design for access and mobility - Enhanced and additional requirements – Buildings and facilities

AS 1428.5-2010 Design for access and mobility - Communication for people who are deaf or hearing impaired

AS 1670.4-2004 Fire detection, warning, control and intercom systems - System design, installation and commissioning - Sound systems and intercom systems for emergency purposes

AS 4292.4 Railway safety management – Signalling and telecommunications systems and equipment

AS 60529 Degrees of protection provided by enclosures (IP Code)

AS 7702-2014 Rail Equipment Type Approval

**Legislation**

Disability Standards for Accessible Public Transport 2002

Disability Standards for Accessible Public Transport Guidelines 2004 (No. 3)

Disability (Access to Premises – Buildings) Standards 2010


**Transport for NSW standards**

T MU SS 90002 ST Shelter at Railway Stations and Interchanges

T MU TE 21001 ST Equipment Rooms and Cubicles

T HR TE 41001 ST Packet Switched Networks Wired - Local, Metropolitan, and Wide Area Networks

T HR TE 41002 ST Wireless Data Communication in LIPD Class Licensed Bands

T HR TE 81001 ST Telecommunication Equipment – Physical Interfaces and Environmental Conditions
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4. Terms and definitions

The following terms and definitions apply in this document:

AEO  authorised engineering organisation

AFILS  audio frequency induction loop system

AGC  automatic gain control
allocated space (as defined in DSAPT 2002) "... space that can accommodate a wheelchair or similar mobility aid."

associated PID a PID in same distinct passenger use area as a PAS

availability (as defined in AS 4292.4) measure of the percentage of time that an item of system is able to perform its designated function

BCA Building Code of Australia

capital maintenance also referred to as renewals, is the refurbishment or replacement of an existing asset, that has reached the end of its useful life, with a new asset capable of providing the current or agreed alternative level of service as the existing asset. Capital maintenance is funded from the CAPEX budget.

CFR constant failure rate. (as defined in IEC 60050-191) That period, if any, in the life of a non-repaired item during which, the failure rate is approximately constant.

conveyance (as defined in DSAPT 2002) "a conveyance includes … any other rolling stock, vehicle or vessel classified as public transport…"

CPU central processing unit

CSD Customer Services Division of Transport for NSW

discretionary customer information non-essential information that may be helpful to a customer’s journey and includes but is not limited to:

- TfNSW promotional material - marketing material produced by TfNSW or TfNSW-led promotions or campaigns, and may be produced in conjunction with external parties
- non-TfNSW promotional material - marketing material produced by external parties for community interest promotions or campaigns
- non-TfNSW information and signage - may include locality information, retail signage, historical interpretation
- commercial advertising - paid marketing material designed to promote products or services

distinct passenger use area area accessible to passengers, including the general public, enclosed by a discernible boundary

*Note that this includes areas that are open or partially covered, in addition to rooms or other enclosed spaces within a building*

*Examples include a platform, paid concourse, unpaid concourse, thoroughfare, rolling stock carriage*

DSAPT disability standards for accessible public transport
EOS end of sale; the date when the original equipment manufacturer (OEM) withdraws a product from sale, both directly and through its authorised points of sale; for example, distributors and resellers

FRU field replaceable unit

INP industrial noise policy

IP code (as defined in AS 60529) coding system to indicate the degrees of protection provided by an enclosure against access to hazardous parts, ingress of solid foreign objects, ingress of water and to give additional information in connection with such protection

LAN local area network; a computer network consisting of switches which forward ethernet frames.

listening area (as defined in AS 1428.5-2010) "... all points inside, outside, over, or under the loop that meet the AFILS specifications at the heights specified above the finished floor level."

MTTF mean time to failure; (as defined in IEC 60050-191) the expectation of the time to failure

new and altered assets the changes made to the rail network other than those as a result of maintenance activities, including decommissioning and removal of assets from the rail network. Maintenance activities are considered those made by AEOs with authorisation for maintenance activities and conducted under that authorisation scope.

operational background noise level (as defined in IEC 60268-16:2011) sound pressure level of background that will be present or is found in the applicable situation

OEM original equipment manufacturer

PAS public address system; inbuilt sound amplification system used to broadcast information messages to the public

PID passenger information display

public transport building (derived from Premises definition in DSAPT 2002) a building "that an operator provides for passenger use as part of a public transport service."

RAM reliability, availability, and maintainability

RBD reliability block diagram

recurrent maintenance also referred to as routine maintenance, is the regular ongoing day-to-day work that includes the immediate prevention and correction of failures/defects in assets to ensure the assets are in a safe and operational state. Recurrent maintenance is funded from the OPEX budget.

reliability (as defined in AS 4292.4) the ability of an item of equipment or a system to perform a required function under stated conditions for a stated period of time or at a given point in time.

SIRI service interface for real-time information
5. System functions

Section 5.1 through to Section 5.6 specifies the PAS functional requirements for public transport buildings and conveyances.

5.1. System states and transitions

The PAS shall implement the states and transitions for different message types as shown in Figure 2. All states have an additional transition (not shown in Figure 2) with event 'new message' and action 'add to queue'.

The following are the different message types that change the state of the system:

- emergency – spoken
- emergency – automated
- transport service – automated
- extemporaneous – spoken

![Figure 2 - State transition diagram for messages](image-url)
5.2. **Spoken announcements**

Spoken announcements by an operator using a microphone or the like may be made for extemporaneous or emergency messages.

Spoken announcements by an operator shall not be made for information about transport services, such as regular service information, and planned and unplanned disruptions.

*It is presently not feasible for spoken announcements to be textually displayed due to the complexities of the transport environment. These complexities include ambient noise, diversity of speakers and an unconstrained lexicon. As such any messages announced in this way are not able to be delivered in an accessible format to all passengers without direct assistance being provided.*

Emergency messages shall pre-empt all other message types.

Following the conclusion of a spoken announcement the PAS shall return to the ‘idle (wait for message)’ state as shown in Figure 2.

5.3. **Automated announcements**

Automated announcements, whether initiated by an operator or machine, shall be textual and vocalised using the text-to-speech (TTS) voice synthesis function as defined in Section 5.6.

Automated announcements shall be delivered using audio (including hearing augmentation) and visual channels to relevant public transport buildings and conveyances.

Through consistency and high intelligibility, automated announcements can increase service levels for people with low literacy, people with cognitive impairment, and people with hearing impairment.

Messages for automatic announcement shall be added to a priority queue.

The PAS shall service messages according to their assigned priority.

The PAS shall enforce the structure and content of messages according to business and operational rules.

The PAS shall sequence ‘transport service – automated’ messages across adjacent distinct passenger use areas so that the announcements do not overlap.

5.4. **Design, installation and commissioning for emergency purposes**

The public address system may be used to assist in the orderly evacuation of persons in emergencies, even where a sound system for emergency purposes is not required by the *Building Code of Australia*. 
In public transport buildings, the local PAS shall meet the following requirements:

- comply with the power supply, sound system installation requirements and commissioning defined in section 3, section 4 and section 6 of AS 1670.4-2004
- comply with the requirements of AS 1670.4-2004 where required by the *Building Code of Australia (BCA) - volume 1 section E4.9 (e) (ii)*
- the 'operator at full load' in AS 1670.4-2004 section 3.4.2 shall be for a period equal to twice the evacuation time, or 30 minutes, whichever is greater.

### 5.5. Alerting passengers

An audible alert shall be made immediately prior to all announcements.

*Note that announcement alerts include the following:*

- a chime or tone
- a visual alert on passenger information displays
- dimming lights for one second

Alerts shall comply with T MU HF 00001 ST *Human Factors Integration – General Requirements* and be approved by TfNSW Customer Services Division (CSD).

Unplanned disruptions shall use both audible and visual alerts and the audible alerts shall be different to that used for other messages.

### 5.6. Voice synthesis

The voice synthesiser shall be able to create audio messages in real-time from textual sources using text-to-speech translation.

The voice synthesiser shall be able to integrate pre-recorded speech, such as words or phrases, from voice actors.

Where pre-recorded speech is used, the voice synthesiser shall use the same voice actor. This may require the definition of a custom voice for the voice synthesiser. Custom voices are created by recording all of the sounds inherent in a language using the desired voice actor.

The voice synthesiser shall support a custom user dictionary of words with their orthographic and phonetic pronunciation.

The voice synthesiser shall support the customisation of speech output to adjust message intonation, expressivity and mood.

The voice synthesiser shall operate without network connectivity in an offline mode.
6. **System interfaces**

Section 6.1 through to Section 6.9 specifies the PAS system interface requirements.

6.1. **Interfaces to operators**

An operator may initiate a spoken or automated announcement.

Announcements shall be made from any authorised network connected device such as a microphone, phone, tablet, computer, dispatcher terminal and crew console subject to operational rules.

The local PAS shall have at least one device each to initiate spoken and automated announcements.

Where a device uses a wireless local area network (WLAN) interface to initiate announcements, a functionally equivalent device that does not use WLAN shall also be provided.

6.2. **Interfaces to transit information exchange**

The PAS shall consume the following service interface for real time information (SIRI) functional services:

- Stop monitoring (SM), vehicle monitoring (VM) and general messaging (GM) as defined in CEN/TS 15531-3 *Public Transport - Service Interface for Real-time Information Relating to Public Transport Operations - Part 3: Functional Service Interfaces*.


6.3. **Local area network (LAN) to wide area network (WAN)**

The PAS shall operate over local and wide area networks that comply with T HR TE 41001 ST *Packet Switched Networks Wired – Local, Metropolitan, and Wide Area Networks*.

6.4. **Local area network (LAN) to wireless wide area network (WWAN)**

The PAS shall operate over a wireless wide area network with an average one-way delay of 20 ms.
6.5. **Speakers to passengers**

Section 6.5.1 through to Section 6.5.4 specifies the interface requirements between speakers and passengers.

6.5.1. **Audio coverage**

Audio coverage requirements for public transport buildings refer to zones described in Appendix A of this document.

*Note if full compliance to AS 1670.4-2004 is required as defined in Section 5.4 of this document, additional audio coverage may be required for emergency purposes.*

In conveyances, audio coverage areas shall include all passenger use areas.

In public transport buildings, audio coverage shall include the following zones:

- information (blue) zones
- portal (red) zones
- waiting (green) zones
- toilets located on platforms in facilities (yellow) zones

Figure 3 shows audio coverage on a platform as indicated by hatched zones.

![Figure 3 Indicative platform showing audio coverage areas](image1)

Figure 4 shows audio coverage on a concourse as indicated by hatched zones.

![Figure 4 Indicative concourse showing audio coverage areas](image2)

TfNSW Customer Services Division (CSD) shall be consulted to determine whether additional zones shall be covered at specific locations as part of the development of the scope of works.
6.5.2. **Audio intelligibility**

The speech transmission index (STI) as defined in IEC 60268-16:2011 shall be at least 0.54 using the STIPA ‘with noise’ method.

The operational background noise level shall be measured according to clause 7.8.2 and 7.8.3 of IEC 60268-16:2011.

*Note that this value is consistent with the guidance contained within IEC 60268-16:2011 Annex G category F for ‘good quality PA systems’.*

In the event of a partial functional failure resulting in a reduced STI, these areas shall provide a STI of at least 0.42.

*Note that this requires that adjacent speakers are driven by a different amplifier, that is, the speakers are interleaved. This allows for audio coverage at a reduced intelligibility while the system is being repaired, rather than a total loss of audio coverage to an area.*

The average normalised frequency response of the PAS shall be as follows:

- +3 dB and -6 dB between 200 Hz and 250 Hz
- ± 3 dB between 250 Hz and 8,000 Hz
- +3 dB and -6 dB between 8,000 Hz and 10,000 Hz

Where used, pre-recorded speech shall be normalised using the method defined in ITU-R BS.1770-3 *Algorithms to measure audio programme loudness and true-peak audio level*.

The PAS shall implement real-time ambient noise compensation and automatic gain control (AGC).

In boarding areas of public transport buildings, time-sequenced speakers shall be used.

Audio associated with discretionary customer information shall be silenced when an announcement is made on the PAS within the same distinct passenger use area.

6.5.3. **Enhancements within information (blue) zones**

Information (blue) zones within public transport buildings shall have an enhanced intelligibility covering the zone or 10 square metres containing the zone, whichever is greater.

The STI shall be at least 0.66 at operational background noise levels unless the equivalent A-weighted noise level (L_Aeq) of a typical announcement exceeds 80 dB(A).

*Note that this is based on announcement duty cycle of 25% and an eight hour average daily noise exposure levels (L_Aeq,8h) below 75 dB(A) as recommended by the Managing Noise and Preventing Hearing Loss at Work Code of Practice.*
6.5.4. **Noise intrusiveness and sleep disturbance**

In public transport buildings, the local PAS shall comply with the *NSW Industrial Noise Policy* (INP):

The intrusiveness criteria, that is $L_{Aeq,15\text{ min}} \leq \text{rating background level (RBL)} + 5 \text{ dB}$, shall be used to determine the project-specific noise levels as defined in the NSW INP.

Potential sleep disturbance impacts from the operation of PAS shall be assessed according to the NSW INP considering the maximum noise levels during shoulder periods within *Application notes – NSW industrial noise policy*.

In conveyances, PAS shall comply with *T HR RS 00100 ST RSU 100 Series – Minimum Operating Standards for Rolling Stock – General Interface Standards*.

Note that the Rail Infrastructure Noise Guideline does not apply to the operation of communication systems as defined in Schedule 1 of the Protection of the Environment Operations Act 1997.

6.6. **Audio frequency induction loop system (AFILS) to passengers**

Section 6.6.1 and Section 6.6.2 specifies the interface requirements between AFILS and passengers.

6.6.1. **Hearing augmentation coverage**

Hearing augmentation is required wherever PAS are installed.

The total hearing augmentation coverage within a distinct passenger use area shall not be less than 10%.

In conveyances, the hearing augmentation coverage shall include all allocated spaces.

In public transport buildings, each hearing augmentation coverage area shall not be less than 10 square metres.

The hearing augmentation coverage requirements for public transport buildings refer to zones described in Appendix A of this document.

The hearing augmentation coverage within public transport buildings shall include the following zones:

- information (blue) zones associated with entries and exits
- waiting (green) zone associated with the defined boarding assistance point

Figure 5 shows hearing augmentation coverage on a platform as indicated by hatched zones.
Figure 5 Indicative platform showing hearing augmentation coverage areas

Figure 6 shows hearing augmentation coverage on a concourse as indicated by hatched zones.

Figure 6 Indicative concourse showing hearing augmentation coverage areas

6.6.2. Audio frequency induction loop system

AFILS shall be installed and made available in areas requiring hearing augmentation coverage unless exceptional technical factors are determined, such as where background magnetic noise level requirements of AS 1428.5-2010 cannot be met.

AFILS shall comply with section 4 and appendix A of AS 1428.5-2010.

Compliance with other sections of AS 1428.5-2010 is not required.

Note that the coverage requirements of section 3 of AS 1428.5-2010 does not apply as the requirements differ from clause 21.1 of AS 1428.2-1992.

The boundaries of listening areas shall be designated by signs compliant to the symbols and signage requirements of section 16 and section 17 of AS 1428.2-1992.

Note that the signage requirements of clause 5 of AS 1428.5-2010 does not apply as the requirements differ from clause 21.1 of AS 1428.2-1992.

AFILS shall be fitted with AGC.

6.7. Passenger information displays to passengers

Associated passenger information displays (PIDs) shall display the textual representation for all message types except the following:

- emergency – spoken
- extemporaneous – spoken
In public transport buildings, associated PIDs shall display messages for at least 10 seconds.

6.7.1. **Enhancements within information (blue) zones**

In public transport buildings, an associated PID shall be installed in each information (blue) zone where displayed announcements shall comply with AS 1428.2-1992 clause 25 ‘viewing ranges’ and clause 17.2 ‘height of letters in signs’.

6.8. **Interfaces to network management**

Programmable electronic equipment comprising the PAS shall comply with the following sections of T HR TE 81002 ST *Telecommunication Equipment - Network Management*:

- Fault and performance management
- Configuration management
- Name resolution
- Time synchronisation
- Management information bases

*Note that the network management requirements for LAN, WAN, and WLAN subsystems are contained within T HR TE 81002 ST.*

6.9. **Interfaces to physical environment**

In public transport buildings, equipment comprising the PAS shall comply with T HR TE 81001 ST *Telecommunication Equipment – Physical Interfaces and Environmental Conditions*.

In conveyances, PAS shall comply with the following standards:

- T HR RS 00126 ST *Electronic Equipment Supplied for Passenger Rolling Stock*
- T HR RS 00164 ST *Cable for Passenger Rolling Stock*
- T HR RS 01701 ST *Mounting and Installation of Electrical Equipment*
- T HR RS 10001 ST *Electric Auxiliary Power Supply and Battery System for Passenger Rolling Stock*

The electromagnetic compatibility between AFILS and railway signalling and other systems shall be assessed.

AFILS shall not degrade performance of railway signalling and other systems.

AFILS shall be demonstrated to not degrade performance of railway signalling systems.
In public transport buildings, equipment not installed in an equipment room or cubicle shall comply with a minimum IP code rating of IP54 as defined in AS 60529.

In conveyances, equipment not installed in an enclosure shall comply with a minimum IP code rating of IP54 as defined in AS 60529.

7. **Subsystem interfaces**

Section 7.1 and Section 7.2 specifies the PAS subsystem interfaces to LANs and WLANs.

7.1. **Interfaces to local area network**

Subsystems interfacing with LAN subsystems shall comply with T HR TE 41001 ST as data terminal equipment.

LAN subsystems shall comply with T HR TE 41001 ST.

7.2. **Interfaces to wireless local area network**

Subsystems interfacing with WLAN subsystems shall comply with T HR TE 41002 ST *Wireless Data Communication in LIPD Class Licensed Bands* as data terminal equipment.

WLAN subsystems shall comply with T HR TE 41002 ST.

8. **Non-functional requirements**

Section 8.1 through to Section 8.10 specifies the PAS non-functional requirements.

8.1. **Availability**

The PAS shall only be considered available to a distinct passenger use area if all functions and interfaces are available, including the following:

- speakers to passengers interface compliant with Section 6.5 (audio channel)
  
  *Note that reduction of STI is considered a failure.*

- AFILS to passengers interface compliant with Section 6.6 (augmentation channel)

- PID to passengers interface compliant with Section 6.7 (visual channel)

The minimum availability requirement for the PAS to a distinct passenger use area is 99.9%.

Availability shall be demonstrated by the reliability block diagram (RBD) method as part of the reliability, availability, and maintainability (RAM) programme.

8.2. **Interoperability**

Open standards shall be complied with, instead of proprietary alternatives.
8.3. **Maintainability**

Maintenance programs shall be developed for all components modelled by an increasing failure rate such as fans, filters, transceivers, and connectors.

Maintenance programs shall be developed to detect imminent or conditional failures such as thresholds for CPU and memory, interface utilisation and errors, temperature, power supply current and voltage, and radio frequency coverage.

Maintenance programs shall be developed for all assets to ensure that the hardware, firmware, software, physical and logical configuration is as designed throughout the life of the asset.

Where installed in a redundant configuration, cards and modules shall be able to be inserted or removed without affecting system operation, that is, hot swappable. Hot swapping shall be performed in hardware without issuing any system commands.

8.4. **Manageability**

Configuration datastore, running configuration datastores and startup configuration datastores are defined in IETF RFC 6241. However, implementing the requirements in IETF RFC 6241 is not required.

PAS shall support the following logical configuration management capabilities:

- support separate running and startup configuration datastores
- retrieve all of a configuration datastore
- load all of a configuration to a target configuration datastore
- create or replace a configuration datastore with the contents of another configuration datastore
- delete a configuration datastore
- retrieve running configuration

Note that the manageability requirements for LAN, WAN, and WLAN subsystems are contained within the respective standards, T HR TE 41001 ST and T HR TE 41002 ST.

8.5. **Performance**

Performance requirements with confidence levels and confidence intervals (margin of error) of the PAS shall be specified.

The confidence level shall be 95% or greater.

The confidence interval (margin of error) shall be 10% or less.
The acoustic and AFILS performance shall be analysed using a simulation tool. Performance shall be verified by testing in compliance with T MU TE 81003 ST Test Processes and Documentation for Programmable Electronic Systems and Software.

8.6. Reliability

Failure models inclusive of the failure distribution and required parameters for all field replaceable units (FRU) that comprise PAS shall be specified. For example, a common failure model is the constant failure rate (CFR) with exponential distribution and mean time to failure (MTTF).

The MTTF of all CFR field replaceable units shall exceed 150,000 h.

In public transport buildings, failure model parameters shall comply with the yearly average temperature for reliability, availability, maintainability, and safety calculations as defined in EN 50125-3.

In conveyances, failure model parameters shall comply with the yearly average temperature for reliability, availability, maintainability, and safety calculations as defined in EN 50125-1.

Acceptable methods for predicting the failure model for electronic equipment, as stated in the following standards, shall be followed:

- PD IEC TR 62380
- Telcordia SR-332 Issue 3
- MIL-HDBK-217F Notice 2

Where multiple MTTF estimates are available, the lowest estimate shall be used.

Failure models shall be justified by stating the data source, methodology, environment, assumptions, and parameters.

8.7. Work, health, and safety

PAS shall comply with the safety of information technology requirements as defined in EN 60950-1.

8.8. Security

Security requirements for PAS include physical security and information security.

8.8.1. Physical security

In public transport buildings, all equipment shall be installed within equipment rooms and cubicles that comply with T MU TE 21001 ST Equipment Rooms and Cubicles, or with a
minimum vertical clearance of 2400 mm from any ground and floor surface to reduce the likelihood of vandalism.

Note that T MU TE 21001 ST requires compliance to the Australian Government Physical security management guidelines.

Installations on platforms of railway stations shall also comply with the canopy structure envelope and clearance set back from platform edge as defined in T MU SS 90002 ST Shelter at Railway Stations and Interchanges.

In conveyances, all equipment shall be installed in compliance with T HR RS 01701 ST.

8.8.2. Information security

Network security requirements for LAN, WAN, and WLAN subsystems are contained within the respective standards, T HR TE 41001 ST and T HR TE 41002 ST.

8.9. Supportability

The supportability life cycle is shown in Figure 7 and Figure 8 and parameters are set in Table 1.

An advance notice shall be issued by the original equipment manufacturer (OEM) more than six months (180 days) prior to the end of sale (EOS).

Equipment comprising the PAS shall only be submitted for type approval if the following supportability requirements are met in accordance with clause 4.3.2 of AS 7702-2014:

- OEM guarantees that EOS is at least 'I' years from the date of proposed commissioning
- the equipment has been first offered for sale for less than 'S' years from the date of proposed commissioning

While product is available for sale, full software and hardware repair and replacement services shall be available.

Software support services for operating system software shall be commercially available for at least 'U' years following EOS.

Hardware repair and replacement services shall be commercially available for at least 'U' years following EOS.

Table 1 Parameters for the supportability life cycle model

<table>
<thead>
<tr>
<th>Equipment</th>
<th>I (years)</th>
<th>S (years)</th>
<th>U (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Network amplifier</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ambient noise sensor</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>AFILS amplifier</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
Type approval is withdrawn at EOS in accordance with clause 7.2.1 of AS 7702-2014.

While software support and hardware repair and replacement services are available after EOS, use of the product may continue; however, it shall not be in accordance with clause 3.2.2.8 of AS 7702-2014.

When software support or hardware repair and replacement services are unavailable after EOS, use of the product shall be discontinued.

8.10. **Sustainability**

Equipment comprising the PAS shall comply with the restriction of hazardous substances directive requirements as defined in EU 2011/65/EU.
Appendix A  Zones within public transport buildings

The audio and hearing augmentation coverage requirements for public transport buildings, including stations and stops for heavy rail, light rail, and rapid transit are based on zones. The zones represent the needs of customers in different areas as they progress through different journey stages:

- Orange is the ‘identification’ or ‘approach’ colour. It is used to highlight areas reserved for identification of the mode and station name.

- Blue is the ‘information’ colour. It is used to highlight areas where customers need to plan their trip, find the right platform, see what time their service leaves, make a connection to another mode of transport, or find a destination in the local precinct.

- Purple is the ‘circulation’ colour. It is used to highlight pinch points and other physically constrained areas that need to be kept clear so that customers can move comfortably and efficiently.

- Red is the ‘portal’ colour. It is used to highlight critical decision points and portal areas, including entries and exits, stairs, ramps, corridors, escalators and lifts.

- Yellow is the ‘facilities’ or ‘boarding’ colour. It is used to highlight the facilities that customers need most often, including toilets, ticket machines and windows, customer service and boarding areas.

- Green is the ‘waiting’ colour. It is used to highlight the spaces where customers can comfortably wait for their service, having gathered the information they need for their journey.

Every public transport building requires a specific application of the wayfinding zones. If a specific application of the wayfinding zones is unavailable, it shall be developed in consultation with TfNSW Customer Services Division (CSD).